ELECTRICAL WORLD

AUGUST 1, 1931
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The purchase of the principal assets of American Brown Boveri Co., Inc., by Allis-Chalmers Manufacturing Company, is now complete. This is the last time the "A.B.B." trademark will appear, for the name "American Brown Boveri" will be discontinued.

But it is not the intention of Allis-Chalmers to submerge the identity of American Brown Boveri equipment. The principal lines of electrical apparatus, railway, and blower equipment will continue to be manufactured with the same distinctive characteristics.

The key men of American Brown Boveri are now with Allis-Chalmers. They bring with them their engineering skill, their vast experience, their outstanding craftsmanship, and their record of brilliant achievement.

They are free to work under the same patents and franchises, backed by the research and old world experience of Brown Boveri & Co., Ltd., of Baden, Switzerland. They are supported by Allis-Chalmers resources and facilities. They will continue to build American Brown Boveri equipment under the name of Allis-Chalmers.

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The acquisition of these new lines will round out the Allis-Chalmers service to the electrical industry; so that Allis-Chalmers can now offer practically every major form of power or electrical equipment.

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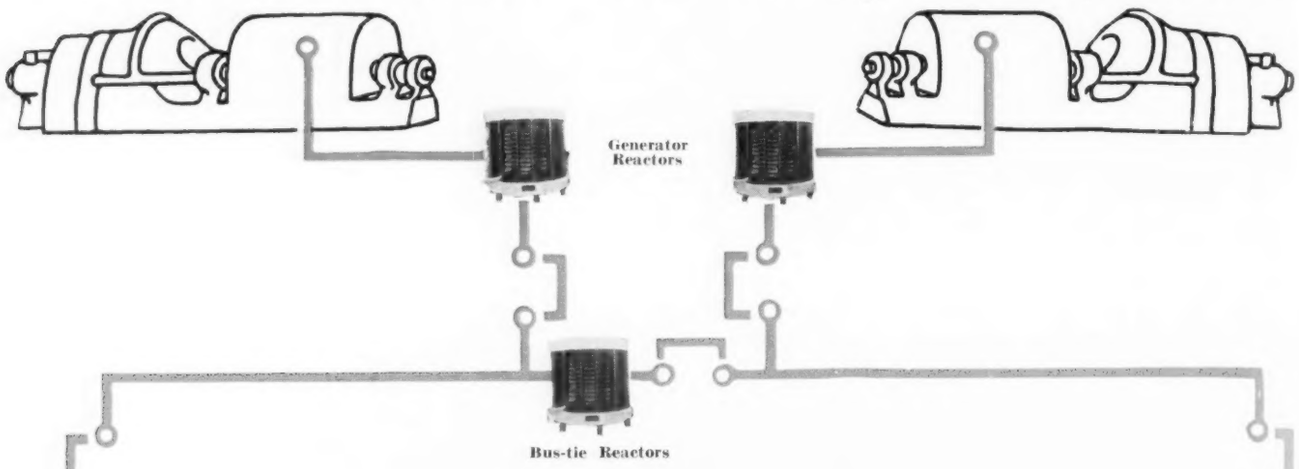

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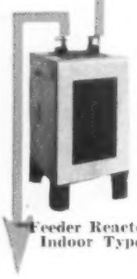
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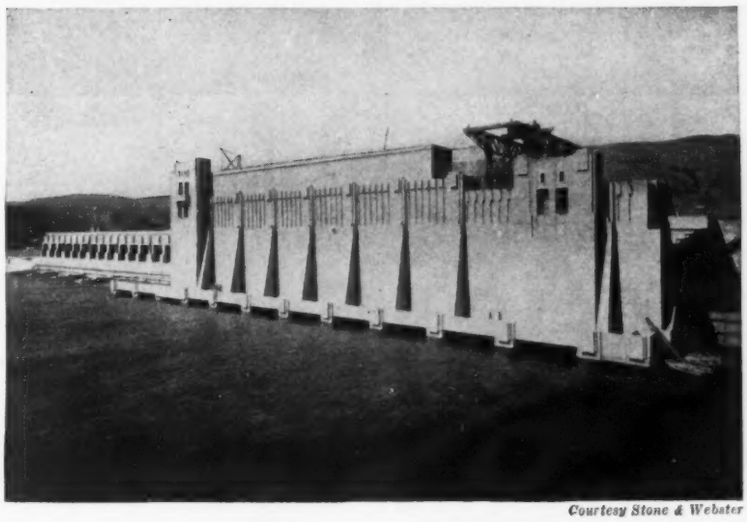

Rock Island development Washington Electric Company, Columbia River, Wash.

Courtesy Stone & Webster

AUGUST 1, 1931

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Electrical World articles are indexed in Industrial Arts and Engineering Indexes, available in public libraries

McGRAW-HILL PUBLISHING COMPANY, INC., Tenth Ave. at 36th St., New York, N. Y.

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CABLE ADDRESS: *"Machinist, N. Y."*

Published weekly. $5 per year. 25 cents per copy. Entered as second-class matter, January 20, 1907, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

Member A.B.C.
Member A.B.P.

NUMBER OF COPIES PRINTED THIS ISSUE, 17,610

NEW YORK District Office, 285 Madison Avenue
WASHINGTON, National Press Building
CHICAGO, 520 N. Michigan Avenue
PHILADELPHIA, 1600 Arch Street
CLEVELAND, 501 Guardian Building
ST. LOUIS, 1556 Bell Telephone Building
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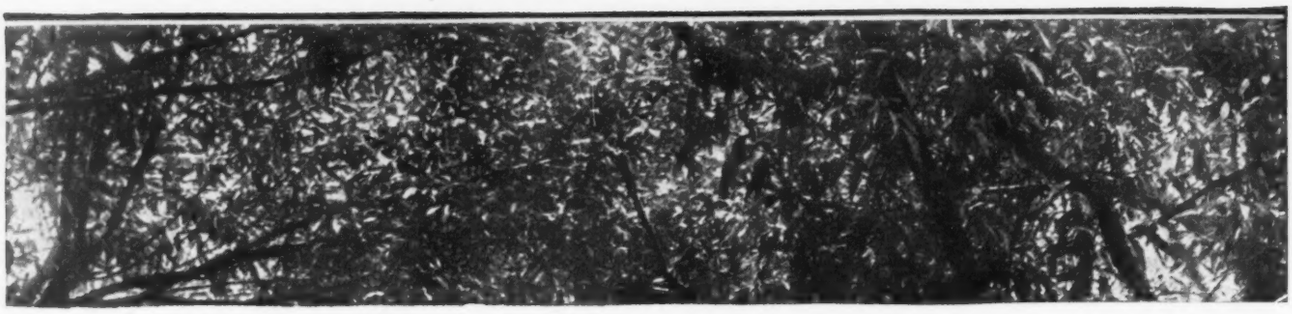

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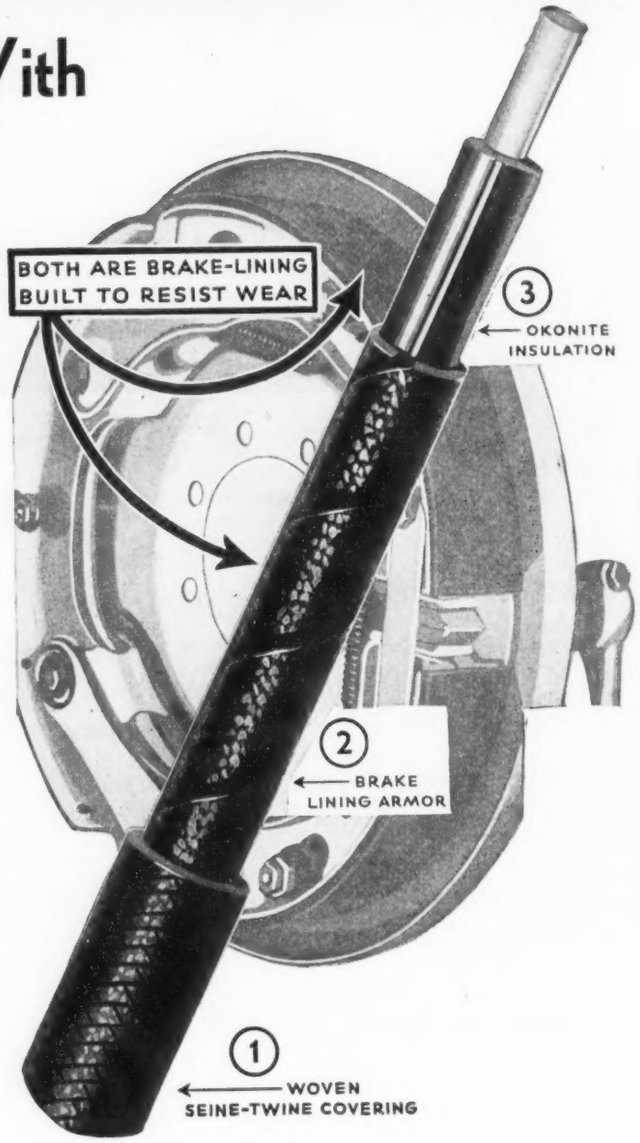

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OKONITE QUALITY CANNOT BE WRITTEN INTO A SPECIFICATION

ELECTRICAL WORLD

for the Week Ending

August 1, 1931

Federal Trade report on utilities due in 1934

We shall have, undoubtedly, revision and strengthening of state laws regulating utilities. That is proper and desirable, and neither utilities nor investors have any reason for concern over it.

MATTHEW S. SLOAN,
President
New York Edison Company

—**Long-continued proceedings** not likely to be reported upon as complete for some time. Commission's court case against Bond & Share for right to full data may be heard this fall—*p. 178.*

—**Undercurrents in the industry** point to a keen appreciation of critical comments. One executive, who insists upon anonymity, says what he thinks of impending possibilities—*p. 188.*

N.E.L.A. sponsors water-heating plan

—**Controlled water heating** approved by N.E.L.A. committee, which is about ready to issue its formal report. A market of 300 installations per 1,000 home customers seen. Program for market approach formulated—*p. 178.*

—**Gas control in oil breakers** is crux of the problem, says a consulting engineer. This resolves itself into restraint and direction as well as control of rate of generation and limitation of pressure—*p. 192.*

—**Beauharnois scheme indorsed** by Canadian parliamentary committee, which visits condemnation on politicians and promoters. Financing difficulties are said by banker to jeopardize project—*p. 179.*

—**Dust-proof equipment merits** are proved in industrial plants where comparisons with earlier dust-proof substations could be made. Experience of one large concern shows 25 per cent gain in over-all costs—*p. 208.*

1,325,000 kva. available for tests

—**High-power laboratory tests** of equipment available at Westinghouse plant, where 1,325,000 kva. installation permits full analysis to destruction under service energy values—*p. 198.*

—**System planning and operation** co-ordinated to insure continuity of service. Dispatching, protection and communication are vital elements in Southern California Edison organization—*p. 204.*

Reading electrifies its branch lines

Trade Commission Utilities Report in 1934—Bond & Share Court Case in Fall

By PAUL WOOTON
Washington Correspondent ELECTRICAL WORLD

A FINAL report in the investigation of the electric utilities being conducted by the Federal Trade Commission probably will not be ready to submit to Congress before 1934. More than three years have been required to build up the present record, which represents about one-fourth of the work to be done. In addition, more or less work has been done regarding the remaining companies. Judging from the time required to do the work that has been done and from the present status of the field work, it seems probable that three more years will be required to complete the work.

When the big job is done it will be a complete financial history of the electrical industry from the time of the first carbon lamp. Mergers in the industries are covered as far back as 1886.

The careful compilation of this history, from which much of value can be drawn, is in itself believed to be worth a material part of the large sums it is costing the public and the industry. The investigation also is seen to be of value in forestalling investigations which Congress otherwise would probably authorize from time to time.

The commission acknowledges in its last annual report that it is proceeding with the co-operation of the industry. In the hope that the record may present a good picture of the general situation, full authority has been extended by the commission to the attorneys representing the industry as a whole, or to those representing the individual companies, to cross-examine witnesses or to offer testimony in rebuttal. In this way it is expected that a valuable addition to the literature on utility financing will be built up.

It is conceded that all of the financing was not done carefully. The investigation comes at a time when the electrical industry is just entering upon a new era of development. This is in distinct contrast with the investigation of railroad financing, which came after most of the lines had been built. If mistakes have been made in connection with utility financing, they will be revealed by this investigation and can be corrected with the probable result that increased public confidence will be gained. This will make easier, it is predicted, the financing of railroad electrification and the other great projects which soon must be undertaken.

Legal representatives of the Federal Trade Commission and of the Electric Bond & Share Company have virtually completed and agreed on a statement of facts for use in the case pending before the United States Court for the Southern District of New York. It is expected that this case will come up for argument early in the autumn.

▼

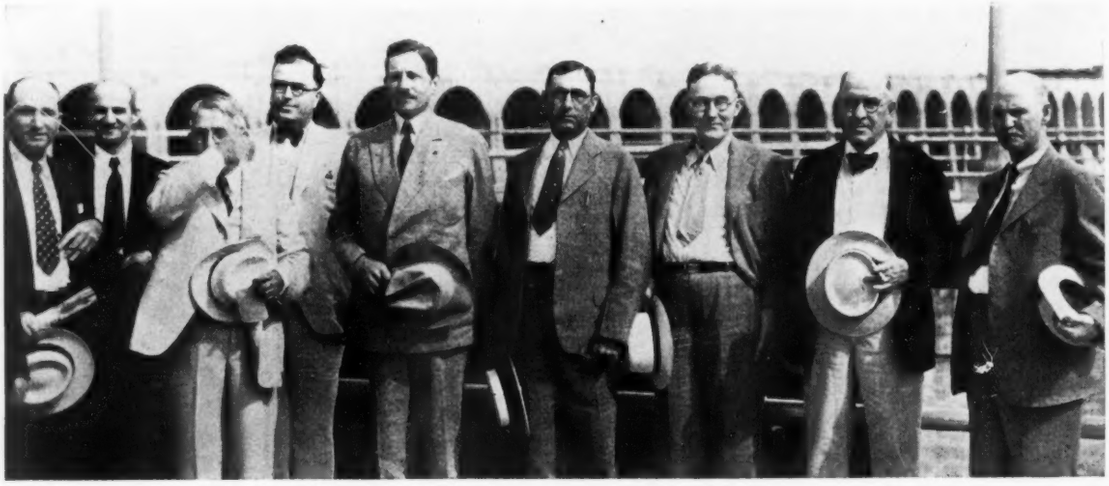
Controlled Water Heating Indorsed by N. E. L. A.

BECAUSE OF ITS service appeal to the public, its economic advantages to the power company and the unusually large possibilities of expansion, controlled service water heating will receive hearty indorsement in the forthcoming report of the National Electric Light Association's water-heating committee, soon to be distributed. It is claimed that the equipment and experience now available point the way in some cases to a market of the order of 300 installations per 1,000 home customers connected. The market of $4 to $5 per month per customer is the one which makes large saturation possible, resulting in satisfaction to customer and company alike and insuring continuous revenues over a long period. The broad and profitable markets lie among those who cannot afford to pay large sums for water heating but will pay a limited amount for a genuine and most serviceable hot-water supply.

Rates must be low and within the means of customers for a complete serv-

▼ ▼ ▼

A NEW THREE-BRANCH COMMISSION GRAPPLES WITH MUSCLE SHOALS



Secretary of War Hurley, in the center, is flanked on each side by members of the nine-member commission on Muscle Shoals representing the federal government, Alabama and Tennessee. President Hoover's appointees are Edward A. O'Neal, president American Farm Bureau; Colonel H. B. Ferguson, army engineer, and J. I. McMullen of the Judge Advocate General's department. Alabama is represented by W. F. McFarlane, W. H. Smith and S. F. Hobbs; Tennessee by Mercer Reynolds, J. F. Porter and W. A. Caldwell. The first meeting is scheduled for August 4.

ice; heating and controlled equipment must be strictly modern and require the lowest investment cost consistent with the best service; installed prices must usually not exceed $175 to $200 if the above saturation ratio is to be attained; terms of $10 down and long-term payments must be available, and there must be competent sales forces which will equip only satisfactory "prospects."

The committee report will show that controlled service means annual overhead costs ranging from $6 to $8 per customer compared with $40 to $60 in the case of uncontrolled service. By selecting the right design and tank sizes, the best of service can be furnished with charging periods of not more than twelve hours per day. By splitting the twelve-hour total periods into periods of six hours or less, depending upon local conditions, two customers using 4,000 kw.-hr. each per year can be served per kilowatt of demand at the generator. With a suitable heater, a stagger control makes possible the sale of 8,000 kw.-hr. per kilowatt of generating capacity where the storage tanks are properly selected. It has been proved that two and a half customers can be connected per kilowatt of generating capacity with stagger control. After all, it is the net earnings per kilowatt of capacity that count, and these may easily reach $70 to $80 gross per kilowatt-year at a 50 per cent operating ratio, comparing most favorably with electric ranges and other household service.

▼

Beauharnois Plan "O. K." Individuals Condemned

So far as the special parliamentary committee is concerned, the Beauharnois inquiry at Ottawa has come to an end. There is much speculation both in political and business circles as to what developments will take place following the presentation to Parliament of the committee's findings. These findings urge development of the project in such a manner as will best serve the people of the Dominion, insisting also that such action should not prejudice the rights of the Province of Quebec and that the project must not be imperiled by delay.

Condemnation of the part played by Senators W. L. McDougald, Andrew Haydon and Donat Raymond is expressed in the report. The committee suggests that R. A. C. Henry, vice-president and general manager, is not "a fit and proper person to continue in the management of this great public utility." R. O. Sweezey, president, is dealt with at length in connection with campaign fund contributions, and the declaration is made that he, in association with H. B. Griffith, secretary, and at least two other unnamed directors, "was the instrument by which approximately $300,000 of the company's funds was misused, as he alleges for campaign purposes." Personal contributions by Mr. Sweezey to campaign funds, which, the committee finds, according to the evidence, amounted to approximately $700,000, have special reference. This money, it says, was "shamelessly, wastefully and needlessly" spent for the "express purpose of obtaining favorable consideration of the company's proposals to the government." The committee also finds that the work of construction of the Beauharnois Canal is proceeding according to plans which have not received the approval of the Governor-in-Council or of the Minister of Public Works and criticises J. B. Hunter, Deputy Minister of Public Works, and K. M. Cameron, chief engineer of that department.

The committee's recommendations are:

1. That the Parliament of Canada take such action as may be within its power, and without prejudicing the rights of the Province of Quebec, to procure the development of this project in such a manner as will best serve the people of Canada.
2. That should the rights of the Dominion and the Province of Quebec come in conflict, every effort be put forth to arrive at a satisfactory agreement, so that the project may not be imperiled by delay.
3. That definite action be taken to preserve the rights of navigation and the complete jurisdiction of Parliament in respect thereto.

Sir John Aird, president Canadian Bank of Commerce, on the last day of the inquiry, stated emphatically that current revelations were jeopardizing the company's prospect of completing its project. To continue the work the company will have to float another bond issue at once, for at present it is living on temporary bank advances. Sir John stated quite frankly that in view of what has emerged from the inquiry his own bank is hesitant about making further advances aid to the enterprise.

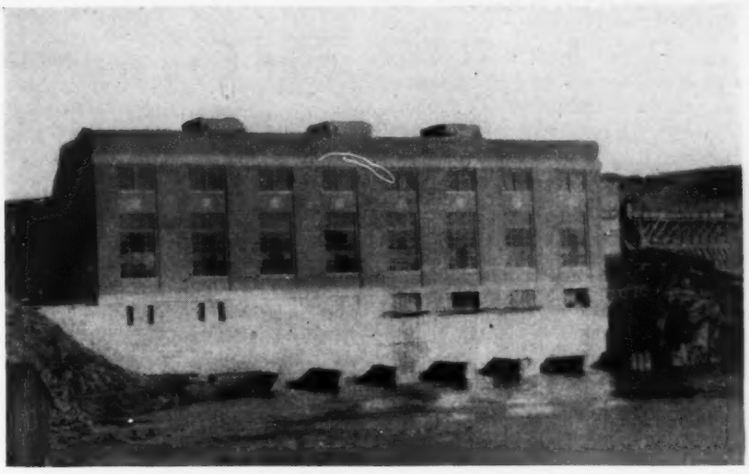
▼

Court Adjudication for New Hampshire Cases?

Indications are that issues in the investigation by the New Hampshire Public Service Commission of the New Hampshire Gas & Electric Company and the Derry Electric Company, both owned by the New England Gas & Electric Association of Cambridge, Mass., and units of the Associated Gas & Electric System, will be reviewed by the New Hampshire Supreme Court. The commission this week denied motions for rehearing the case and ordered the two companies to show cause on or before September 10 why a long list of orders covering management and operation should not then be effective. Additional findings with regard to the Derry Electric mortgage bonds were handed down.

Robert W. Upton, counsel for the companies, said that the commission's action means that "we shall probably ask the Supreme Court for a review of the commission's order." His petition for rehearing had contended that the commission's orders were "clearly unlawful and unreasonable."

ANOTHER PLANT ON NIPIGON RIVER IN SERVICE



The new Alexander Falls 54,000-hp. hydro plant, in northern Ontario, is the second constructed on the Nipigon by the Ontario Hydro Commission. Like the 75,000-hp. plant at Cameron Falls, it supplies power to the Thunder Bay system and serves the cities of Fort William and Port Arthur, 80 miles distant.

▼ ▼ ▼

Utility Measures in Georgia Legislature

By a vote of 187 to 6, the Georgia House of Representatives has passed a reorganization bill reducing the departments, bureaus and agencies of the state from 102 to 17. Among the sweeping changes made by the measure are a reduction of the membership of the Public Service Commission (to be rechristened the Commerce and Utility Commission) from five to three and making the term of office of the commissioners four years.

The abolition of all service and demand charges by electric power and gas companies is sought by a measure introduced in the House.

The first of a series of bills designed to assist municipalities in operating their own utility plants has been introduced. It provides that no city can lease, sell or otherwise dispose of its power plant, or any interest in such plant, for a period longer than two years. Present laws limiting the amount of bonded indebtedness prevent the rapid expansion of such plants in keeping with the normal growth of municipalities, it is explained, and sponsors of the measure claim that it will enable municipalities to obtain necessary aid without losing control of their plants. A companion measure soon to be introduced will permit the issuance of bonds based wholly upon the value of utility plants and retired out of the earnings of such plants.

A taxation bill provides for an annual tax of $2 on each $100 of gross receipts from intrastate business of electric, gas, telephone and telegraph companies.

▼

Reading Electrification Now in Operating Stage

With the putting into service this week of 140 multiple-unit electric cars on the Reading Company lines out of Philadelphia, the stage of operation has been reached in this extensive enterprise. About 144 points are directly or indirectly affected by the improvement. The electrified track covers 63 route miles, including Reading Terminal via Jenkintown to West Trenton, on the New York branch; Jenkintown to Lansdale and Doylestown, on the Bethlehem and Doylestown branches, and Glenside to Hatboro, on the New Hope branch.

The undertaking is important not only for its immediate improvement of facilities at Philadelphia, where it will increase train speeds from 15 to 25 per cent, but for its future possibilities. The Reading and the Central of New Jersey will be embraced in the greater Baltimore & Ohio system, now nearing complete integration. When this consolidation is completed, it is planned to run trains from Philadelphia to New York by electricity.

Through its use of 11,000 volts of alternating current the Reading electrification will correlate with the hundred-million-dollar electrification now in progress on the Pennsylvania's main line between New York and Washington. Work on the Pennsylvania electrification is being rapidly pushed. The cost of the Reading electrification was $21,500,000. Electrification will provide an increase in efficiency of 31 to 73 per cent besides increasing speed.

▼

New Plans for Plant on Grand River, Okla.

Application has been made to the Oklahoma Conservation Commission by the Grand Hydro Electric Company, Tulsa, of which Wash E. Hudson is president, for a permit to construct initial units of a series of hydro-electric plants on Grand River (also known as Neosho River) in northeastern Oklahoma. Hearing is set for August 17. If finally completed according to original plans, the Grand River hydro project will cost about $35,000,000 and will generate more than 400,000 hp.

First construction under plans filed with the commission will be a concrete storage and power dam and power house to contain as initial equipment two generating units of 12,500 kva. capacity each and a stream-flow-equalizing and power dam. Cost of the initial units is represented in the application as $5,000,000.

This application for new permits follows a series of quietly conducted activities along the river. The site selected for dam No. 1 of the series is in Delaware County, 3½ miles east and 1¼ miles south of Ketchum. The concrete storage and power dam is to develop a 50-ft. head, designed so that it can be raised to 65 ft. The power house is to be of concrete and steel. Appropriation of 3,000,000 acre-ft. of water per year is asked in the application.

Grand River hydro developments of large proportion were agitated as early as 1920. Previous permits were transferred about three years ago to the present holders, who are said to plan to dispose of power to existing distributing organizations. The Public Service Company of Oklahoma has properties in the district.

The application proposes completion of one-fifth of the work on the initial units within two and one-half years, with five years for completion. Sites of dams under the permits already held are near Wagoner, Mazie, Morgan Inn, which is east of Pryor, and Ketchum.

OHIO CAPITAL'S "CITADEL" IN NIGHT ARRAY

Gleaming white in the daytime, the 555-ft. American Insurance Union Citadel at Columbus, Ohio, loses nothing in beauty when illuminated after dark, with four great Westinghouse beacons serving as a guide to airmen.

▼

Ohio Companies Pay Tax on Imported Electricity

Payment by the Ohio Power Company of $448,255 and by the Wheeling Electric Company of $25,607 last week as back taxes on electrical energy imported into Ohio from other states marked the final acceptance by those companies of the contention of Attorney-General Gilbert Bettman that the United States Supreme Court decision obliging the East Ohio Gas Company to pay a tax under state law on imported gas applies equally to companies importing electricity (Electrical World, July 4, page 7). With the gas-company payments, the state will receive nearly $2,000,000 in back taxes.

"With the constantly increasing use of electricity there will be continuously increasing annual revenues under Ohio's excise taxes on public utilities," the Attorney-General said. "The principle established in this case, that gas developed in foreign states when distributed locally does not retain exemption by reason of the interstate commerce clause of the Federal Constitution, and therefore is taxable by Ohio, now apparently means that this state will receive half a million dollars in taxes annually from gas and electric utilities hereafter."

Political Expenditures by California Utilities in 1930

PUBLIC UTILITIES operating in California under the jurisdiction of the Railroad Commission expended (eliminating cents) $93,121 for political purposes during 1930, as compared with $91,862 during 1929 and $36,188 during 1928, according to their annual reports to the commission, that body announces. The bulk of the 1930 expenditures was made by three companies, as follows: Pacific Gas & Electric Company, $25,942; Southern California Edison Company, $37,488; Market Street (San Francisco) Railway Company, $25,500.

The amount listed for the Pacific Gas & Electric Company represents expenditures in a campaign against the proposed bond issues to be floated to purchase the distributing systems of the Pacific Gas & Electric Company and Great Western Power Company within the city of San Francisco. The expenditures of the Southern California Edison Company were made in a campaign to defeat a proposed power bond issue of $13,300,000, because, according to its vice-president, W. C. Mullendore, analysis "disclosed that at least two-thirds of it was to be used for uneconomical and unjustifiable duplications of already existing facilities," a matter of "direct and vital interest" to the company, which underwrites the city's entire power supply.

In September, 1930, the California Railroad Commission ruled that public utility companies may expend funds to defend their business against political attack, but only upon condition that the expenditures be charged against the stockholders.

▼

Diesel-Engine Contract by Missouri Town Upset

A RULING BY THE Missouri Supreme Court against the contract under which the city of Harrisonville, Mo., agreed to purchase from Fairbanks, Morse & Company Diesel engines and other equipment for a municipal power plant, to be paid for out of the net earnings of the plant after it was in operation, has been handed down. This ruling was based on the ground that one of the provisions of the contract created a general obligation against tax funds and that as a result the town's constitutional limitation of indebtedness was exceeded. The purchase price with interest totaled $71,629, to be paid for in 60 monthly installments.

Suit to restrain the city from carrying out the contract was brought by the Missouri Public Service Company and several taxpayers. The opinion characterized as a subterfuge a contract provision that the city was to purchase from itself, at the regular rates, power for its water plant, street lighting and other municipal purposes, since the evidence showed the city had no money available for that purpose. The court held that both parties to the contract knew these payment would have to be made from funds raised by taxation.

The ruling does not overturn or modify the previous decision of the Missouri Supreme Court in the Fayette case, in which it sustained a contract by which Fayette purchased equipment for a municipal light plant to be paid for out of earnings. The difference is that the Fayette contract was not held to involve the use of tax funds, the saving in cost of producing electricity being relied upon to meet the installments as they came due.

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TO RELEASE ATOMIC ENERGY

—Acme Photos

Dr. A. H. Compton, University of Chicago physicist, has made very delicate atomic measurements with a specially constructed X-ray spectrometer as a preliminary to a long study of imprisoned intra-atomic force.

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Commission Condemns Optional Rate Schedules

INQUIRY INTO THE optional rates of the Long Island Lighting Company led Milo R. Maltbie, chairman New York Public Service Commission, this week to oppose such charges. He said:

Public utilities are under the legal obligation to charge every consumer in a class the same rate. It is the general rule that where the service is identical the rates must be identical. There may be no difference in rates unless there are differences in the service rendered, and the difference in rates must be reasonable and not unduly discriminating or unduly preferential.

As a matter of fact, it is admitted that under optional rates, as in the instant case, customers using exactly the same amount of gas or electricity and in the same month are charged different rates. The only defense is that an option has been given to the customer; that if he does not select the most advantageous rate it is his fault and that he must keep informed of his option and act wisely.

The commission directed the company to prepare new uniform schedules, eliminating the optional feature. The conclusion has been drawn that the commission may seek from the Legislature authority to order utilities to grant rebates to customers who have undesignedly chosen the more expensive among optional methods of charging.

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Dr. McLaughlin Defends Shannon Administration

BREAKING HIS SILENCE on the issues connected with the two-day debate in the Irish Free State Dail on the Shannon River hydro plant, Dr. Thomas A. McLaughlin, who was managing director of the Electricity Supply Board until recently, when, as already reported, the political situation brought about his retirement, said in a statement printed in Dublin newspapers just to hand:

I now want to state publicly what I have persistently maintained in private—that whatever the difficulties may have been in the management of this great enterprise, and there have, of course, naturally been difficulties in plenty, and however difficult the relations between the board and the minister may have been, one oustanding and important fact remains, and that is the absolute economic soundness of the enterprise and of its development. . . . The enterprise can only flourish if it is well managed and if it has public confidence. In view of all that has happened, these two ends, in my considered opinion, can only be assured by the calling in of experts of world repute in the economics of public electricity supply to report on the enterprise. . . .

The finance and accounts of the board have been primarily called in question, but the whole business policy of the board has also been involved in the discussion. . . . I assert that the board has not overspent by one penny on its legal rights. The liabilities which are erroneously deducted from the £2,500,000 capital to which the board was entitled are the summation of the outstanding loans of local authority electricity undertakings acquired by the board. These loans were raised and spent years ago by local authorities to build electricity stations and networks. They were raised for a period of years and were repayable out of the revenue of the electricity undertakings by annual installments. They should not be confused with the

TWO PACIFIC COAST HAPPENINGS OF RECENT ELECTRICAL INTEREST

*Three hundred newspaper men of northern California were recently shown over the Mokelumne project of the Pacific Gas & Electric Company (*ELECTRICAL WORLD, *October 11, 1930, page 675) on the occasion of its dedication. President A. F. Hockenbeamer of the P.G.&E. (left) was program director for the two-day trip. President A. G. Wishon of the San Joaquin Light & Power Corporation (next) made the first of a number of dedicatory speeches. On the right, President A. B. West of the Nevada-California Electric Corporation is seen as, surrounded by a large group, he threw the switch which permitted 30,000 kw. to be delivered at the Hoover Dam site for construction purposes.*

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£2,500,000, and are repayable by the board, as previously by the local authorities, out of annual revenue.

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San Antonio Company's Reply on Merchandising

THROUGH ITS ATTORNEYS the San Antonio (Tex.) Public Service Company has filed an answer to the suit recently instituted by Attorney-General James V. Allred for forfeiture of the charter of the company and for an injunction restraining it from doing business on the ground that it is selling gas and electrical equipment and supplies and performing other unauthorized functions.

"The said petition shows on its face that this suit is brought without warrant or authority of law," the answer states, "in that it is brought in behalf of and for the benefit of a special class of people—to wit, certain gas and electric appliance dealers—in order to lessen and destroy the competition in their business, and shows on its face that to deprive this defendant of the right to sell and furnish gas or electric appliances as incidental to and in furtherance of the sale of gas or electricity is not for the public interest."

The answer admits that the company has a capital stock of $10,000,000 and that approximately $5,500,000 of it is owned by the American Light & Traction Company, as set out in the Attorney-General's petition. Denial is made of the implication that another outside company, the United Light & Power, owns any of the stock.

The appliances are not sold "upon a large scale of profit," as alleged, the answer states, and the company's predecessors "have at various times during the past 25 years sold such appliances." Nor has the company more than $500,000 invested in gas and electric appliances, the correct figure being said to be approximately $35,000 in stock and outstanding accounts from customers of about $100,000. The company further claims that without the service which it provides many small communities would be without needed appliances.

As a result of the efforts which have been taken by the City Commission to bring about a reduction of utility rates by the San Antonio Public Service Company, an election may be called within the next 60 days to vote on a proposal to establish municipal electric light and power and natural-gas distributing systems, according to Mayor C. M. Chambers. The office of "special utilities attorney," with sweeping power, has been established by the City Council to "head the city's fight to regulate the utilties."

Mayor and Ross Revise Skagit River Plans

ENTERTAINING A PLAN for working out important details of an operating and construction program to be followed by the Seattle Light Department during the coming months and perhaps through 1932, the new Mayor, Robert H. Harlin, and J. D. Ross, recently returned to his post as light superintendent, are beginning a first-hand study of the Skagit River development. For economical reasons, the Mayor states, the matter of providing the department with its own engineering division will be delayed. Although the engineering division was approved by the Seattle voters at the last March election, through adoption of a charter amendment sponsored by Mr. Ross, Mayor Harlin says that it will not be needed until further major projects are undertaken.

It is expected, however, that the Mayor's economy program will allow the light department's present construction and extension program to proceed without interference. This includes completion and equipment of a new power house at Diablo, which will virtually double the department's present capacity of electrical production; also the construction of a new transmission line from Diablo to Seattle at a cost of $1,500,000.

Scattered Happenings in the Electrical Sphere

UNITED STATES

Duke Company Pays Energy Tax

A check for $81,000 has been mailed by the Duke Power Company to the South Carolina Tax Commission as first payment on the hydro-electric tax of 0.5 mill per kilowatt-hour imposed by this year's General Assembly. The Duke company is the largest taxpayer so far, other large power companies having resolved to fight the tax as unconstitutional.

Rate Cuts in 219 Kansas Towns

Voluntary reductions in electric rates charged customers in 219 cities and towns in Kansas were filed with the Public Service Commission last week by three subsidiaries of the North American Light & Power Company—the Kansas Power Company, the United Power & Light Corporation and the Kansas Power & Light Company. The reductions amounted to approximately 15 per cent and applied to both residential and commercial schedules.

Public Ownership Fight at Marietta

A hot contest between a citizens' committee and a fact-finding committee is on at Marietta, Ohio, over electric light and power. A proposal to build a municipal plant will be voted on in the August primaries. The Monongahela-West Penn Public Service Company, which now serves the city, has entered the fight to protect its interests.

Oregon Grange for State-Wide District

Despite the fact that so far Oregon citizens have failed to take advantage of the law permitting them to establish public utility districts and acquire and operate electric utilities, the Oregon State Grange has authorized a special committee to draft an initiative petition providing for a utility district covering the entire state. An initiative measure providing for such a district will be on the ballot at the next general election, according to the Grange's plans.

Indiana Utilities Reorganized

An interlocutory decree issue July 24 by the Indiana Public Service Commission went far toward separating the interurban and the light and power interests of the defunct Terre Haute, Indianapolis & Eastern Traction Company. The Indiana Railroad Company was given authority to acquire certain rail lines of the former interurban company, and the Public Service Company of Indiana took over all the electrical properties in towns along these lines that now are served by the interurban company. The Public Service Company also acquired the lease of the Traction Power & Light Company at Terre Haute and took over interests in three interurban lines, two of them abandoned. All of the properties involved had been purchased at a receiver's sale on behalf of the Insull interests.

Northwest Association Elects Officers

Officers of the Northwest Electric Light and Power Association, which did not hold a general convention this year, were elected at a meeting of the association in Portland recently as follows: President, P. M. Parry, Utah Power & Light Company; vice-president, J. E. E. Royer, Spokane; vice-president for Idaho, R. B. King, Boise; vice-president for Montana, J. C. Ryan, Butte; vice-president for Oregon, L. T. Merwin, Portland; vice-president for Utah, George M. Gadsby, Salt Lake City; vice-president for Washington, L. R. Coffin, Seattle.

Another Hydro Plant in Ozarks

Power will be generated about October 1 by the Siloam Springs (Ark.) hydro-electric plant of the Illinois Water & Development Company, Tulsa, Okla., of which James W. Sloan is head. The dam is completed and generating equipment ready for installation. The plant, costing about $200,000, will eventually become the property of Siloam Springs. The dam and powerplant site are in Oklahoma, on a lake extending into Arkansas. The dam is 600 ft. long and about 37 ft. high.

Substantial Rate Cut in Iowa

A general primary rate reduction has been announced by the Iowa Southern Utilities Company, which supplies light and power to 158 towns in southern Iowa. The drop is from 11 cents to 9 cents a kilowatt-hour and is the fourth reduction since 1923, when the primary rate was 15 cents.

Kansas Merchandising Law Test

To test the law passed by the Kansas Legislature prohibiting utilities from selling merchandise, the Kansas Public Service Commission has asked the Attorney-General of the state to file a suit in the Kansas Supreme Court, thus settling at once the question of its constitutionality, doubted by the commission's counsel.

Cheat River Case Is Argued

The West Virginia Supreme Court has taken the Cheat River water-power case under advisement after listening to arguments. The case is on appeal from the Kanawha County Circuit Court by the West Virginia Power & Transmission Company, applicant for a license on the Cheat and Blackwater Rivers. The circuit court, as before reported, reversed the Public Service Commission, which granted a license for eight projects. The adequacy of the proposed development and the constitutionality of the 1929 water-power act are at issue.

License Clarifies Uintah River Status

A license has been authorized by the Federal Power Commission to the Uintah Power & Light Company for the power development on Uintah River in eastern Utah. This action not only settles the status of the original unit, constructed in 1920, but makes possible the early enlargement of the plant.

CANADA

A Rival St. Lawrence Plan

Envisaging a scheme of power development on the north side of the St. Lawrence River comparable to the Beauharnois development on the south side, a petition has been filed with Parliament. The petition, which has been made on behalf of Narcisse M. Cantin of Montreal, seeks leave to introduce a bill to construct canals between Cardinal and Cornwall, Ontario, and between Hungry Bay and Laprairie Basin, Quebec. Similar legislation was sought last year, but was not carried beyond preliminary stages.

ABROAD

Mexico Will Tax Imported Power

President Ortiz Rubio of Mexico has signed a decree which levies an import duty on electrical energy transmitted into Mexico. Border cities which depend on plants on the American side of the international line will be affected, but the decree will not go into effect until 1932. From January 1 to July 1, 1932, the duty will be ½ cent (United States money) per kilowatt-hour; from July 1, 1932, to January 1, 1933, 1½ cents, and thereafter 2½ cents.

Coming Meetings

American Institute of Electrical Engineers—Pacific Coast Division, Lake Tahoe, Calif., Aug. 25-28. F. L. Hutchinson, 33 W. 39th St., New York.

Rocky Mountain Division, N.E.L.A.—Stanley Hotel, Estes Park, Colo., Sept. 2-4. G. E. Lewis, 367 Gas & Electric Bldg., Denver.

Electrochemical Society—Hotel Utah, Salt Lake City, Sept. 2-5. C. G. Fink, Columbia University, New York.

Pennsylvania Electric Association—Bedford Springs Hotel, Bedford Springs, Pa., Sept. 9-11. H. A. Buch, Telegraph Bldg., Harrisburg, Pa.

Empire State Gas and Electric Association—The Sagamore, Bolton Landing, Lake George, N. Y., Sept. 10-11. C. H. B. Chapin, Grand Central Terminal, New York.

American Welding Society—Copley-Plaza Hotel, Boston, Sept. 21-25. M. M. Kelly, 33 W. 39th St., New York.

New England Division, N.E.L.A.—Poland Springs House, South Poland, Me., Sept. 28-30. Miss O. A. Bursiel, 20 Providence St., Boston.

Great Lakes Division, N.E.L.A.—French Lick Springs Hotel, French Lick, Ind., Oct. 1-3. T. C. Polk, 20 N. Wacker Drive, Chicago.

Illuminating Engineering Society—William Penn Hotel, Pittsburgh, Oct. 13-16. E. H. Hobbie, 29 W. 39th St., New York.

National Association of Railroad and Utilities Commissioners—Jefferson Hotel, Richmond, Va., Oct. 20-23. J. B. Walker, 270 Madison Ave., New York.

Modernized lighting

with 300-watt units overcomes shadow handicaps of group motor drives and aids long-established plant to compete with newer factories

EDITORIALS

L.W.W.MORROW
Editor

N.E.L.A. convention exhibit—What the manufacturer should do

COMMENT was made recently in the ELECTRICAL WORLD on the disappointment felt by the manufacturers over the small attendance at the splendid exhibit provided at this year's N.E.L.A. convention in Atlantic City. Here was a great display, presenting two years' progress in apparatus and appliances and involving the expenditure of several million dollars, largely wasted because so few operating men and junior executives were attending the convention and so little attention was paid to the exhibit by those higher executives who were there. It was suggested that an appropriate morning be set apart for the study of the exhibition by all delegates and that an appropriate ceremony of review be arranged to make it dramatic and interesting. The flood of letters that have come in commenting on the editorial indicates how deep the feeling is among those manufacturers who spent so much good money to bring this educational opportunity to the convention.

There is another side to it, however. The manufacturer, on his part, through lack of showmanship is failing to capitalize this great exhibition as he should. Probably not more than 40 per cent of the exhibits this year were sufficiently well organized and interpreted to put their stories across. The visitor paused to look at the next booth. Seldom did he see at a glance which features of the display represented progress in the art—and how and why. In few cases was the exhibit clearly explained so that the observer recognized at once what points of interest it offered. Too much was left for the man in the booth to talk about.

The point is this: It is of inestimable value to the industry that there be this annual presentation of progress in equipment and appliances, this vast display that cannot be carried to the customer or seen in any single manufacturer's showroom. Men from different departments of the utilities should be sent to study it and report. Wholesalers and contractors and dealers should be invited to attend, say, on two evenings. On Sunday the show might well be open to the public. In short, this large investment and this unique educational opportunity should be developed and utilized to the utmost.

But to accomplish best results the exhibition itself should be more carefully presented, for an exhibit booth needs to be almost as vocal as a window display. Therefore, while the appeal is being made to the new administration of the N.E.L.A. to give this exhibit a better place in the convention program next year, it would be well for the manufacturers themselves to make plans to take advantage of it more effectively. And this need not add a dollar to the cost.

The Shannon and politics

BACK of the political troubles over the Shannon River hydro enterprise in the Irish Free State lie the ever-recurring conflicts between a business and a political conception of administering the utility. In the original plan engineers and business men were placed upon a board with almost independent authority to build the works and spend an appropriation. Now charges are brought that the board exceeded its appropriation and made very little accounting of its expenditures, and a new act is presented giving the government practically complete authority over the undertaking. The best opinion is that the charges are an excuse for replacing business control with political control.

In a recent statement Dr. Thomas A. McLaughlin, former manager of the board and the engineering and business father of the Shannon

enterprise, pointed out that the excess expenditures were known by the government and covered the purchase of local city utilities and not appropriations made for building the plant. He also stated that confusion occurred in the accounting department both because of the amount of work and the inexperience of the accountants. He asserted that the charges were unfounded and that the board deserved utmost credit for its accomplishments.

From a distance and based upon careful reports, it would seem that Dr. McLaughlin and his associates did a splendid piece of work in bringing the Shannon enterprise to completion. It also appears evident that political plums and jobs available in the going enterprise are too tempting to be passed over by the government politicians. Thus the pendulum is going to swing into political control until bad business results force a return to a business administration. From the point of view of national progress the Shannon plant is being placed under a bad handicap just when it is ready to give full service to Ireland.

Controlled versus uncontrolled power flow

TWO schools of interconnected operation seem to exist—one which attempts to control the magnitude and direction of power flow over the network and another which says let the power flow where it will and operate for the best combination of economy and reliability.

Controlled power flow is evidently the outgrowth of trying to operate each component of an interconnected system as a unit and maintain the flow over system interconnections as though those lines fed customers without generating equipment of their own. This latter assumption is what makes the difficulty, because the adjacent systems are not merely customers ready to absorb power, but in turn they pour power into a pool. There are relationships similar to those between separate stations working in parallel, complicated by the fact that they are not under single control. As a result there must either be phase-shifting arrangements or an unusually alert super-system operator to maintain tie-line loadings.

Letting power flow where it will relieves system operators of duties that distract attention from the more important duty of securing the best combination of system economy and reliability, but introduces the problem of crediting and debiting systems for power received or delivered.

The question arises whether it is worth the investment or operating expense to control power flow or provide an absolutely accurate method of accounting for power delivered and received. In the long run, wouldn't crediting and debiting for net energy exchange, coupled with sharing of peak-capacity fixed charges in proportion to margin between system needs and local generating facilities, be a simpler method? The free flow of power is conducive to maximum economy.

Neon-sign power factor

UNCORRECTED power factors of neon signs vary from 20 to 50 per cent, and the rapid growth of this load in recent years has had an appreciable effect in reducing the power factor of downtown distribution circuits. This low power factor results from the use of high-reactance transformers, each with an output of from 180 to 300 watts and supplying from 30 to 35 feet of tubing at voltages from 2,500 to 15,000.

Two methods for correcting the power factor of neon signs are available. One is to use incandescent lamps in combination, and the other is to use a static condenser with each transformer or in the supply. The combination sign is effective if sufficient non-inductive load is used; for example, 1,100 watts in incandescent lamps and a 600-watt neon sign at 44 per cent power factor will give a supply-service power factor of about 80 per cent. But the proportion of lamps to be used with the tubing is large to get effective correction, and it is frequently inconvenient or undesirable to use lamps from the point of view of the sign buyer or the sign application.

Thus for general correction it would appear advisable to use a high-power-factor transformer for neon signs. Even though the static condenser required increases the first cost of the transformer about 50 per cent, it seldom amounts to 3 per cent of the total installation cost. For example, the ordinary sign transformer might increase in cost from $8 to $13, but if this is measured against an average sign cost of about $8 per foot of tubing, it is readily seen that a sign having 40

or 50 feet of tubing and a total cost of about $700 would involve an almost negligible increase of total cost because of the use of the high-power-factor transformer.

Apparently the answer to the question of neon power-factor correction is best found by a more general use of the static condenser-transformer combination, and an increased use of this kind of installation is noted in the trade. No doubt, a still greater use will make possible a decrease in cost and help to bring more neon sign business. Full information about performance and practice will expedite this development.

Another advantage of electric furnaces

THE ease with which electric furnaces and ovens can be placed in production lines without regard to flues or fuel supply, the comfort with which employees may work in close proximity to them, the absence of gases of combustion to contaminate products handled, the ability to distribute heat so that it will be most effective, and the facility with which temperature can be controlled to assure definite heating cycles, have long been emphasized as advantages that cannot be obtained to the same degree in fuel-fired ovens or furnaces. They are the factors which must be evaluated in dollars and cents when initial cost or operating cost alone is not favorable to electric operation.

But it is doubtful whether industrial plants are as widely aware of the practicability of controlling the atmosphere within electric furnaces and ovens and of the variety of uses to which units with artificial atmospheres have been applied. The recent report (No. 141) of the N.E.L.A. industrial heating committee will be a revelation to some industrial works managers if power salesmen call the contents to their attention, as they will doubtless do.

Among the applications which have been made are the annealing of silicon-steel sheet, three-stage and semi-continuous copper brazing of complete assemblies, bright annealing of cold-rolled steel strip and non-ferrous wire and tubing, and manufacture of tungsten-carbide. Possibly these furnaces may be used on a large scale for annealing sheets for tinplate, galvanizing sheets, autobody sheets and so forth. Furnaces for continuously annealing wide strips have been considered.

Thus another advantage of electric furnaces has been proved by experience that must be taken into consideration before basing selection purely on initial or operating cost.

Its finger is on the pulse of industry

CONSUMPTION of electrical energy is more and more being accepted as an indicator of industrial activity. Output figures constitute news in the daily press because they reflect what is going on in our mills and factories. When use of electrical energy increases, the wheels of industry are humming; when it falls off, there is stagnation. In those industries that can express their production in terms of a unit essentially unchanging from month to month and from year to year comparison with corresponding figures for electrical energy consumption shows how close the relationship is.

The news-print industry affords a good example. According to the News Print Service Bureau, the production during the first six months of 1931 in the United States, Canada and Newfoundland was 11 per cent less than the corresponding output in 1930. Among the indices of industrial activity the ELECTRICAL WORLD has one which is at least approximately comparable if not exactly so; it relates to the pulp and paper industry in the United States alone. For the same period it shows a drop of 9 per cent, the average index for the first six months of 1930 being 131.7; in 1931, 119.8.

Under the circumstances, electric light and power companies serving communities that have active chambers of commerce or similar agencies equipped to make intelligent use of timely data on industrial activity might find it to the public interest as well as their own to furnish comparable monthly data on factory operations. These might be in the form of percentages or index numbers. They can readily be given in such form that the operation of individual plants will not be revealed, if such secrecy is desirable. Incidentally, the influence of this kind of quiet publicity on community thinking might well receive consideration.

Let Correction Come from Within the Industry

An anonymous—but not fictitious—interview

"THE electric utilities are in for a spanking. Whether they deserve it or not, they are going to get it. That is my opinion." So states a power company executive who makes anonymity a condition of his answering the question as to what he thinks of the present distressful situation.

"Yes," he repeats, "we are in for it. And, since we are in for it, it seems to me that the wisest thing for us to do is to anticipate the things we probably will be forced to do after the punishment and do them before it. In this way we shall give these acts an appearance of willingness that they never could have afterward and we will have earned credit for intentions that are good even though there may be some people so unkind as to point out that they are also a little late.

"Do not get the idea that I think that the electric utilities are conspicuously guilty of high crimes and misdemeanors against the ideals of American liberty because I see the hand of wrath descending on them. Do not get the idea either that I think we should not defend our industry vigorously against outrageously untrue charges of politicians or stick up valiantly for the things that we know are right. There are probably other businesses that have more on their consciences than the utilities and that are more deserving of the chastening rod. But the fact is that the power companies are the industry that has been selected for correction, and no crying out that others need it more will change the fact.

"The sins of the utilities have been more of omission than of commission. The principal one has been a failure to recognize the customer in a commercial sense and in an imaginative sense.

"Yes, I know that in the past few years there has been a definite effort to cultivate the commercial aspect of the business, but you simply cannot change the habits of 30 or 40 years in so short a time. And the utilities have never taken into their philosophy any conception of the imaginings about electricity of the people who use their service. That is, they do not know how the people think of electricity. The average person uses electricity every day, but the service he buys from the power company does not anywhere near fulfill his idea of what, if it did not cost so much and if he had the equipment to use it, it might do for him. It is unfortunate that what appears to the utility man to be merely an understanding of elementary economics looks to the man in the street like a deliberate withholding of the boons of the electrical age. Probably the man in the street has an exaggerated idea of these boons and benefits, but it is certainly a tactical error on the part of the utility man to say that they cannot be had because they cost too much. Since the utility man is the one who has the costs in his control, the suspicion is only natural that he should be tempted to control them upward and not downward.

"Rates have gone down continuously in the history of the industry. That does not mean anything to the suspicious nature except to raise the question that probably they have not gone down fast enough nor far enough. Perhaps striking rate reductions at the present time would only serve to intensify that suspicion, but to my mind they can more gracefully precede than succeed the spanking I spoke about."

Office boys and perquisites

The holding company was brought into the discussion by the next question of the interviewing editor. What did the interviewee think of this aspect of the affair? He indicated two things that might profitably be corrected:

"Using office boys for local managers of properties is bad business. If the man in charge of the operation of an electric system is not capable of managing it he should be fired, and if he is capable it is a shame as it concerns the man and a bad mistake as it concerns the holding company for him to be nothing more than the local mouthpiece for decisions made elsewhere.

"And I do not mean that the local executive should be a free agent with only a few limits on his authority necessarily imposed by general holding company policy. I mean that he should be a free agent in the absolute sense and that all that should be required of him is successful operation of the property under his charge.

"And management fees. The holding company is an owner of utility systems. Its reward of ownership is the money earned by the stock shares it holds. It is entitled to nothing more. When it uses its authority as an owner to pay itself a salary as manager then its action is suspected. If through financing, engineering and purchasing advantages due to its size the holding company can be of service to its subsidiaries it should be properly recompensed for the costs it incurs in performing these services. But it should be remembered that the holding company owes its advantage of size to its subsidiaries

and it is not fair to charge them a profit based on the very thing that they supply.

"The prices to subsidiaries for financial, engineering and purchasing services should not be more than the actual cost to the holding company for performing them. It is certainly entitled to no profit on them. The only profit revenue of the holding company in equity and fairness is the dividends earned by its holdings of subsidiaries' stocks.

"The owner of a private, competitive business can, if he likes, manage the business and can pay himself a good salary for doing it. It's his business how he operates his business and the only check on his actions is the condition of the business. But this is not true of utilities. They include a public interest that will not permit such freedom of action. The money that it put into them is entitled to a return reasonable in respect to the risk to which it is exposed. The brains that are put into the utility business either in holding or subsidiary companies are entitled to salaries that will keep them in it. When either the money or the brains takes advantage of its position to appropriate to itself more than it is entitled to, then the public is fully justified in raising a poignant howl and in taking steps to correct the condition."

This free-spoken executive is a believer in his fellow men. The people who work in his company like him and respect him; none of them fears him. He is approachable, human and sincere; his dignity, which is real, includes no hint of stand-offishness. He spoke with great feeling of employee relations and of the utility attitude toward its customers:

"We have got to make our employees, not satisfied in their jobs, but enthusiastic in them. We cannot force our people to take an interest in the business, to learn a lot about it so that they can talk about it understandingly and explain it to their friends and neighbors and business contacts. Employees can resist efforts to fill them up with information just as effectively as can the general public resist such efforts. If their feeling about their jobs is not entirely happy, then they just are not taking any of what they classify as the old hooey about service, public relations and what not. But although we cannot force it on them, we can make employees want to take an interest in the business, want to learn all they can about it. We can do this by recognizing the responsibility of each employee in his job, by paying salaries and wages properly proportioned and not niggardly, but above all by showing every employee that the man over him is his leader, not his arbitrary boss.

"The military idea of obedience to orders and no understanding of them does not work in business. We must get over to our people the thought that they are in and of the organization and clear from their minds the idea that the company is just their employer, hiring and firing as it pleases.

"In this respect it seems to me that there is too great a distance between the executives and the rank and file in the electric utilities. Management should come closer and be more accessible to members of the main body of workers. It should mix with them and thus demonstrate its common humanity with them.

"Every business must consider its customers. The electric companies have for too long permitted their customers to think that they assume a 'take it or leave it' attitude. However true it may have been in the past, I believe that in the present day this public conception is entirely wrong in the cases of most utilities. Generally speaking, they are most anxious to please their customers, but the customers do not know it; at any rate do not believe it. The ideas of franchises, monopoly, non-competition are still in the public mind and it is going to be a hard job to eradicate them. But it can be done and it will have to be done if the power industry is to retain its status as a field for private enterprise. I have no definite recipe for this job to hand out as a cure-all. But I do know what the principal ingredient in the prescription must be. It is friendliness.

"The attitude of friendliness must be in every contact of the utility and the public. It must be apparent in every meeting of employee and customer. It is an expression of the feeling the employee has in his job, for he cannot be friendly to the public if he does not feel that way toward his company and his fellow workers."

"Your conclusion, then," summed up the editor, "is that a rod is in pickle for us, but that we can mitigate the severity of its application. That by correcting certain flagrant abuses in the industry, by doing all that is possible in the direction of lower rates and by building up employee morale, we can put sincerity into the parental remark, 'This hurts me more than it does you,' which will accompany the spanking"?

"That's just about what I think," he replied.

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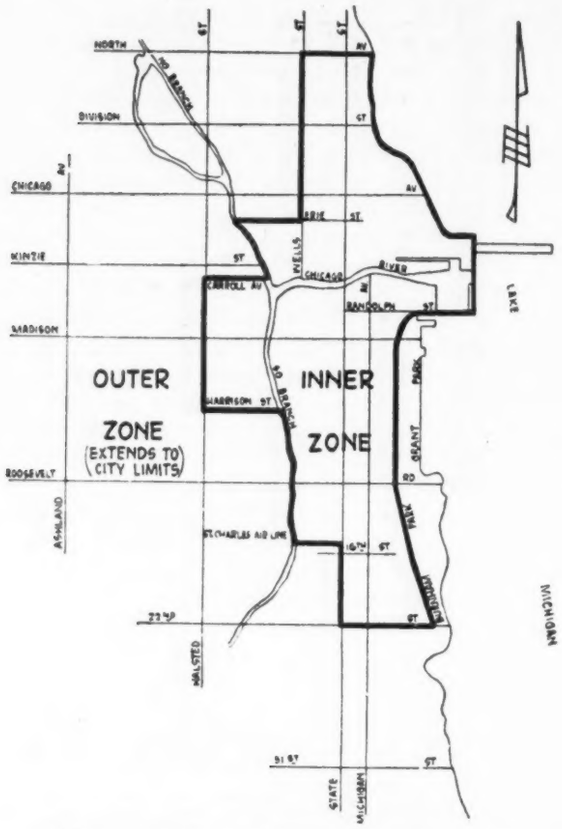
Chicago's D.C. to Give Way to A.C. Network

An alternating-current network to supplement the direct-current distribution in downtown Chicago is the plan of the Commonwealth Edison Company to care for load growth in that area. The decision in favor of the plan was based on two reasons. The first and basic reason is the manifest economy in first cost and operation of the modern alternating-current network as compared with the cost of d.c. distribution. The second and more immediately compelling reason is underground congestion of streets and alleys in numerous locations where such congestion would be greatly increased by the addition to the d.c. system of large new loads already contracted for and in prospect.

These considerations were brought out by R. F. Schuchardt, electrical engineer of the Commonwealth Edison Company, in his announcement of the plan in an address at a recent meeting of the advisory committee of the company. He said:

"From the investment viewpoint the cost of land for downtown substations, the price of which is fixed by its commercial value with respect to retail stores and office space, and the high cost of construction in the neighborhood of skyscrapers requiring caisson foundations bring a constantly increasing burden that cannot well be compensated for in our rates. But the space situation in the

streets is even worse, for there we are headed for an early arrival at physical limits for the required conduit for the cables. The continued increases in demand for energy due to the higher buildings and to the greater use of electricity per capita would soon, if supplied from concentrated conversion points like our present substations, require conduit space of much larger underground capacity than our streets possess. Because of this limitation additional loads to be taken on in the downtown area



Alternating-current network proposed for downtown Chicago

The new distribution will supplement the existing d.c. grid, which is inclosed by the heavy lines on this map. The area is roughly 4½ miles north and south and 2 miles east and west at the widest place.

must be largely supplied from distributed conversion centers, so that the average distance from the center to the customer will be reduced.

"Before alternating-current supply could meet with favor in a district where the battery-supported direct-current network had established such a very fine record two developments were necessary. First, alternating-current equipment had to be worked out to do practically everything that direct current now does in ordinary commercial use. Second, the system of supply had to be equal in reliability to that of direct current. The alternating-current network, as now developed, offers enough economy in general to justify comparatively large expenditures for reserve lines and transformers. And this fact, together with the development of adequate protective equipment, permits an alternating-current installation of very satisfactory reliability.

"It is the intention of the company to supply alternating current in what today is the direct-current area, and which will hereafter be known as the inner zone. The outer zone, which includes all the rest of the city, is already supplied with alternating current. The direct-current system of the inner zone is not to be supplanted. In so far as the existing investment in substations, feeders and mains permits, and with due regard for necessary reserve, loads will continue to be taken on direct current."

In commenting on his announcement to the advisory committee, Mr. Schuchardt pointed out to an editor of ELECTRICAL WORLD that the idea is simply that the new distribution shall assume the supply of future load growth as and where it occurs. The first installation definitely designed as a part of the new plan will be the large tower office building, erection of which will be started by the Marshall Field estate this summer on Adams Street in the block just west of the Edison Building. It is a coincidence that this site, which will be the first nucleus of the a.c. network, is the exact location from which in 1888 the early direct-current grid received its supply. Another beginning point of the network will probably be the new Chicago postoffice, which will be an air-rights structure just west of the Chicago River, to be built over the tracks entering the Union Station from the south.

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New Service Entrance and Service Switch

An experimental development of a new type of service entrance and service switch by a large utility is of interest. These developments were made with the idea of securing greater flexibility and a reduction in cost.

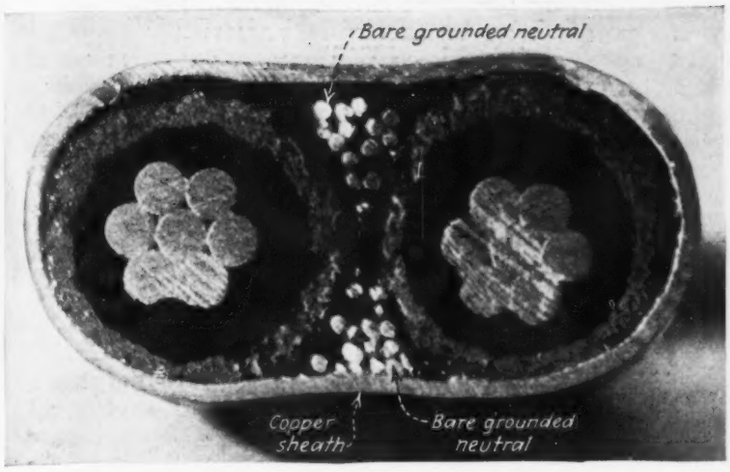
The flexible entrance assembly consists of two ordinary No. 4 wires inclosed with a bare No. 6 wire installed in a thin copper sheath. The sheath is grounded and the bare No. 6 wire can be used as a ground for a two-wire service and as a grounded neutral for a three-wire service. The assembly is $1 \times \frac{9}{16}$ in. in dimension.

The principal advantage claimed for this type of construction is the saving in labor time of installation. The usual entrance is in conduit and invariably it has to be cut in at least two pieces and fitted, perhaps bent. With a flexible entrance assembly, it is said that the hole through the foundation may be smaller, it does not have to be perfectly straight, and no fitting to length is required other than the cutting of the flexible assembly to the approximate total length. There is some advantage from the appearance point of view. There is also the probable advantage of greater life, as conduit in this territory does not stand up any too well, and it is felt that the thin copper sheath will have a materially longer life than the galvanized conduit that has been used.

Of course, in the end, the relative cost of the materials must be taken into account. However, although the utility has no satisfactory estimate as to what such a flexible entrance assembly will cost when it is on a regular production basis, it believes that its cost will not exceed the cost of materials for a conduit entrance.

The experimental switch installation was developed as a part of the service entrance facilities.

In the past the utility installed a 60-amp. service and main switch with only an accessible fuse, safety type of



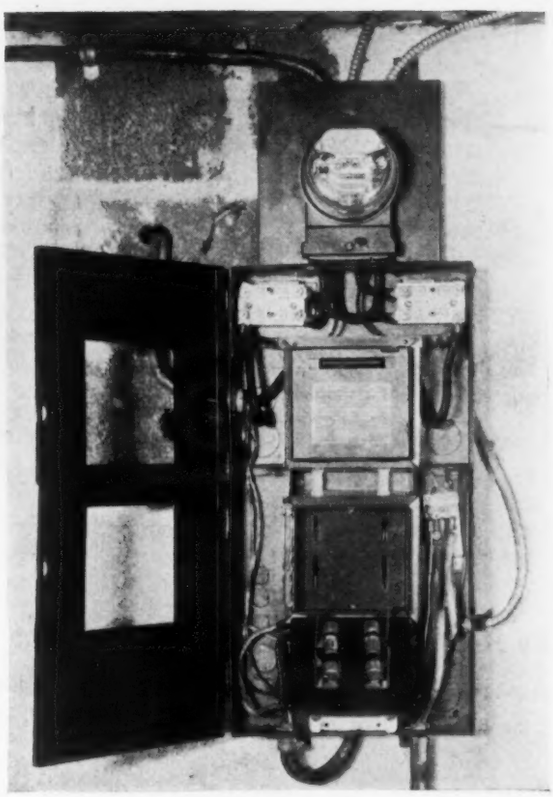
Assembly of flexible service entrance

Two No. 4 wires and a bare No. 6 in a copper sheath.

meter switch. From the other side of the switch and fuse a circuit was run to the old distribution panel (this is in an old home already wired) and a 30-amp. fuse switch was included in this two- or three-wire circuit only when the location of the new switch was at a distance (more than 3 to 4 ft.) from the old distribution panel. In practically 90 per cent of the entrances installed in old homes already wired this condition prevailed.

The utility then connected the range circuit to the customer's side of the meter switch without any additional fuse or other form of disconnection. Thus, any trouble in the range circuit or range that would blow a fuse would blow one of the main fuses, leaving all or part of the rest of the house circuits dead.

Typical use of flexible entrance assembly



Service entrance switch with separate protection for heavy-duty service

The utility felt that this practice would automatically lead to a character of service not satisfactory, and therefore decided that the range circuit itself should have fuse protection independent of the main fuse.

Since in practically every case where a range was being installed the previous entrance was not adequate, it was decided to combine the protection for the range circuit and the protection for the circuit leading to the old distribution center in one cabinet, and it was found that at practically no additional cost fuse protection could be provided for an additional circuit which could later be used for a heavy-duty heating circuit (water heater, bathroom built-in heater, etc.).

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History-Progress Exhibit for Faraday Celebration

As a part of the Faraday celebration to be held in London in September (see ELECTRICAL WORLD, September 13, 1930, page 469) an exposition is planned which will be held in Royal Albert Hall. This is to be entirely devoted to the demonstration of the results of Faraday's work and will illustrate the basic principles and the methods which have made modern wonders possible. The exhibits will include illustrations of Faraday's original experiments, relics of scientific discovery, working models and scientific demonstrations of modern application of electricity in numerous branches of industry. The exhibition will be open from September 23 to October 3.

Gas Control the Crux in Oil Breakers

Problem is one of restraining and directing gas movement, controlling the rate of its generation, limiting the pressures it produces.

By JOHN D. HILLIARD
Consulting Engineer
Allis-Chalmers Manufacturing Company, Milwaukee, Wis.

TODAY there is no difficulty in interrupting any alternating circuit at any voltage, but when there is added "under any condition" it is time for serious consideration before accepting the order, and then perhaps it is advisable to let it go to some one who is more ambitious and willing to pay a good price for experience and possible failure. It is also desirable to consider critically the inherent characteristics of the various breaker principles, several of which have been analyzed in previous issues.*

In the oil Deïon breaker there are shaped and spaced plates of magnetic material inclosed by insulating means. The curved air gap between magnetic limbs of each plate gives a varying magnetic flux and pull on a current within the gap, the pull increasing as the line of current flow is drawn deeper into the gap. There are built into the insulating structure pockets to contain oil; these pockets connect with a slot in the insulating material which widens with the curve line of the magnetic poles.

The breaker functions, therefore, by magnetically drawing the current deeper into the slot as the moving electrode *M* (Fig. 1) is withdrawn further away from the stationary contact *L*, the heat from the arc vaporizes and dissociates some of the oil in the slot and oil pockets and this vapor and gas in its escape from its confinement is driven forcibly into the path of the arc stream, where it cools and deïonizes by turbulence the conducting arc gases, the action being greatly aided, as in the case of the explosion chamber breaker, by the solid carbon particles from the dissociated oil.

In the typical explosion chamber breaker the arc and gas are restrained by the chamber and throat walls and the gas in its exit is directed parallel to the line of the arc and ionized gas flow in the throat, where extinction takes place.

In the Deïon breaker the arc which is held in place by magnetic action generates an ionized gas which is subjected to a gas blast in the narrow confining slot, and in a direction at right angles to the line of arcing. The fundamental action in the two breakers is therefore identical, but differs in detail.

Magnetic blowout and blast methods of arc extinction have been well known for years, but

(a) how to apply these methods so as to assure the confinement of the conducting gas and prevent other arcs being established as the one operated upon is extinguished,

(b) how to prevent the too sudden interruption of the circuit at other than zero current value with its accompanying almost irresistible voltage rises and resulting arc overs,

(c) how to so insulate as to guard against punctures and deterioration from carbon deposit, which would cause breakdown,

(d) how to build mechanically so as to safeguard against bursting pressures, bending moments and impact pressures on materials with their inherent strength limitations,

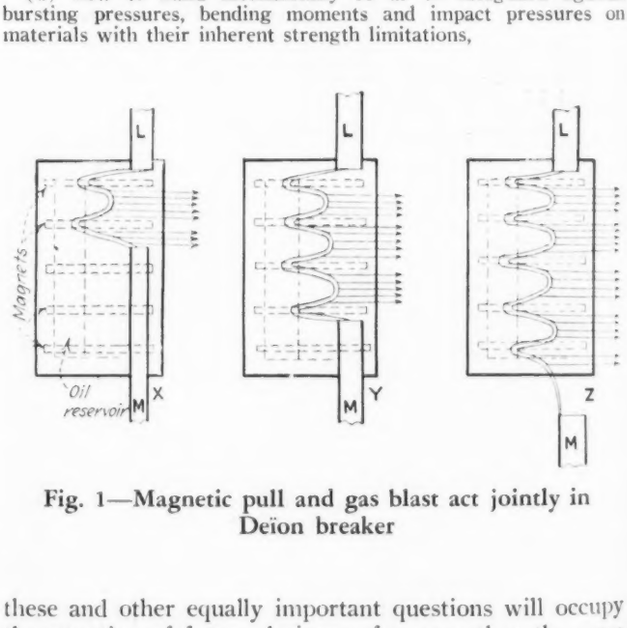

Fig. 1—Magnetic pull and gas blast act jointly in Deïon breaker

these and other equally important questions will occupy the attention of future designers far more than the mere theory of operation.

With the oil Deïon breaker a new way of holding the ionized gas in place so it could be "swatted" by the blast was found, but our old enemy gas pressure, tending to blow apart the narrow slot, is still on the job, as is the pressure, on the slot and bushing structure, equal and opposite to the pressure required to accelerate the oil away from the space occupied by the generated gas.

The surrounding oil can move away from the gas, but if any part of the structure moves it is nearly certain to be a failure of the breaker.

Both types of breakers are subjected to these stresses

*See "Electrical World," May 2, 1931, pages 809-811, and July 11, 1931, pages 56-59.

and it is simply a matter of the one best adapated to stand them that determines which is the best breaker. The writer has pretty definite ideas on this matter, but this is not the place to express them.

It has been held that the greater the rate of gas formation the greater the interrupting efficiency of the breaker. My citation of the top vented explosion chamber (ELECTRICAL WORLD, July 11, 1931) I believe proves this statement not to be universally true. In this case the less the quantity of gas the less the chamber and tank pressure and the greater the breaker efficiency, and if we could do the impossible and find an insulating liquid which would not give off any gas from solution or dissociation we would have a perfect interrupter.

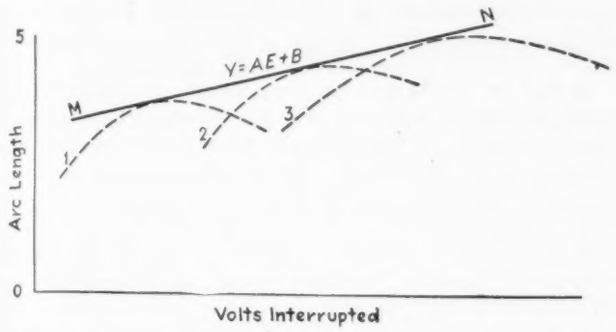

Fig. 2—Envelope of maximum contact separations in three series breaks

I might add that as soon as we learn to evacuate and hold evacuated to the proper degree an insulating tube, when we can produce a metal with gas neither in solution nor in combination to form a metallic oxide, etc., which may act to set gas free as the contacts are heated at parting, then we shall not need oil breakers, because there will be no possible ionizing to permit a current flow and interruption will be an uncanny, sure and easy operation, but meanwhile oil breakers will in all probability be in use for some years to come.

The general public using oil breakers has, I believe, little conception of the forces acting in the oil tanks when the breaker interrupts a short circuit, and I do not here refer to electromagnetic stresses, but to stresses produced by gas generation.

For illustration, a modern 15-kv. breaker of the plain break type in a 20-in. diameter tank generates about as much gas at its interrupting rating as would be generated if one pound of sporting gunpowder was exploded in the tank, both measurements being based on the quantity of gas generated at 0 deg. C. and atmospheric pressure. What the "brisance" or shattering effect would be depends upon the speed of interruption of the circuit as compared to the speed of burning of the powder.

The speed of burning of the powder depends upon the confining pressure, which in the breaker would be fairly low, so that the relative effects in the breaker tank should be nearly identical—electrical interruption being assumed as taking place in two half cycles of arc or in 0.04 second.

With the increasing demand for shorter arcing periods and higher interrupted currents in the breaker the brisance will increase very fast, and when we arrive at the ultimate of interrupting in one-half cycle of arc on a 60-cycle system and a large current flow, we shall be working with dynamite as compared with gunpowder in the above illustration.

It will not be so much a question of the actual quantity of gas generated as of the speed of generation, not a question of ability to bring about interruption in the time specified, but of our ability to build a structure able to stand the mechanical impact stresses on the tank itself and members contained therein.

The preceding indicates the necessity for the serious consideration from a mechanical standpoint of materials used, of the method of application of the stresses to the material, of the necessity of avoiding a bending moment on materials of low tensile strength, of the use of as nearly straight compression stresses as is possible and of using all available means to reduce to a minimum all impact stresses in the tank.

The smaller the quantity of gas generated in a given time for a given interruption the smaller will be the stresses, the more the rate of gas release in the tank can be controlled the smaller will be the stresses, and gas control both in its generation and release, together with efficient deionization, are the most important factors in breaker design.

Great claims have been made for the "multiple-break breaker," although in reality the breaks are in series, and I think it would clarify matters considerably if we casually considered the matter from a theoretical standpoint.

Series-break breakers which have a rectilinear motion

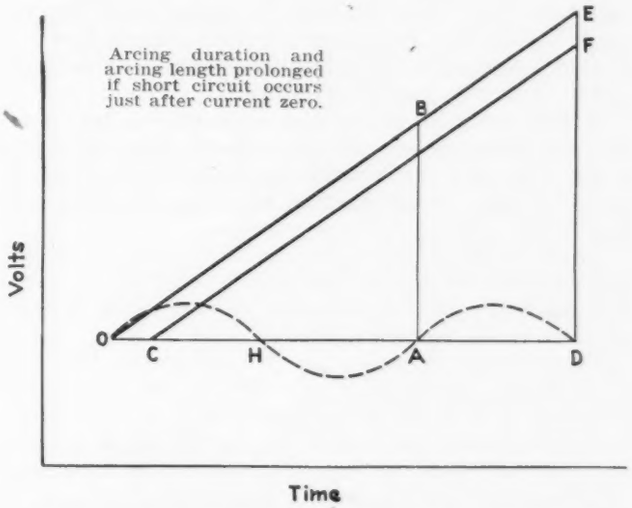

Fig. 3—More gas may be evolved when more breaks are used

to the moving member have at least as much mass in the member as the plain-break two-break breakers, so that the operating speed as referred to a single break in each base should be practically the same, and in our consideration of the breaker we shall assume this to be a fact.

In Fig. 2 are typical curves 1, 2, 3, representing the envelope curves covering the arcing distances; i.e., contact separation at interruption, obtained in, say 15-kv., 37-kv. and 73-kv., two-break breakers; i.e., the maximum separation of contacts giving interruption in the three breakers is the peak of curves 1, 2, 3.

If we draw a line *M N* tangent to these curves we have a line representing the peak arcing distances on breakers up to 73 kv. At higher voltages there would

ordinarily be a droop in the line because of the smaller current interrupted. The equation of the line $M\ N$ is of the form $Y = AE + B$, in which Y is the arc length, E the voltage of the circuit and A and B constants depending upon the circuit and other conditions at the instant of interruption. In any event, A has a value small as compared with B. The form of this equation was first established by Mrs. Ayrton many years ago.

In applying this equation to series-break breakers we may assume that the contact members are, in construction, equivalent to a series condenser in which the voltage between plates is a function of plate separation and area. We may assume that in the breaker these are equal. That is, of course, not strictly true because of the large capacity of the two end plates (contacts), but there will be no serious error if we assume an equal distribution of line volts between plates.

Using the above assumption as a basis of calculation and thus calculate the break distance of each of the series breaks, it will be found that each individual break is much longer than would be estimated if an inverse proportion to breaks was applied to the line voltage.

Multiple breaks may increase gas volume and pressure

As thus calculated the length of each individual arc in a four-break breaker would be roughly 80 per cent of each arc length in a two-break breaker and under certain conditions each of the four arcs may be as long as each arc in a two-break breaker. One need not be surprised, therefore, if double the quantity of gas was to be obtained from a four-break breaker that would be had from a two-break breaker interrupting the same circuit, under the same conditions.

It was assumed in the above illustration that there was no phenomenon such as magnetic blowout, which might affect the arc duration in the assumed cases. If there was such a condition then, of course, the deductions would not apply.

To still further clear the matter, let us refer to Fig. 3 and assume that normal interruption may take place in two full half cycles of arc under definite speed of moving contact and current conditions; that is, if we assume the short circuit thrown on at O, interruption will come at A with an arc length of AB. If now the short circuit is applied at C (one-quarter of a wave length after O), then interruption cannot take place at the minimum possible two half waves of duration, because the zero value of current has been passed and interruption will come at the next zero value, or at D, with a resulting arc length of DF.

In the first case we had an arc duration of two half cycles and in the second case of two and three-quarter half cycles; that is, there was a resulting gas formation of $\overline{2}^2$ to $\overline{2.75}^2$ or 4 to 7.5; in other words, there was a theoretical increase of gas generation of 87 per cent in the two and three-quarter cycles case.

If we apply this reasoning to a line of series-break breakers it is easy to see why the volume of gas may be double in an assumed case over the two-break volume. It is, of course, true that in a large number of series breaks the generated gas may be equal to or less than that generated in a two-break breaker, but in such a series-break breaker there is always the liability of arc-over between the adjacent breaks, which may result in a stabilized arc and the destruction of the breaker.

A few words had perhaps better be said concerning the so-called "gas-blast" breakers; that is, breakers using a blast of air, carbon dioxide, hydrogen or nitrogen. Within certain limits these breakers should give fair operating service:

(a) If the gas supply is kept at normal pressure.
(b) If the gas supply is kept dry; i.e., without precipitation of moisture.
(c) If carbonization or other deterioration has not taken place.
(d) If all mechanism operates normally.

It will be found that as the current to be interrupted increases the pressure of the gas effecting interruption must also be increased, and as I interpret the matter, not because more un-ionized gas is required to deïonize, but more likely because the larger current has volatilized more metal, produced a higher temperature in the gas, with a resulting greater pressure in the arcing space, causing a "backfire" or backing up of the ionized gas into the delivery gas pipe supplying gas to effect deïonization; this gas, having no solid particles to accelerate deïonization, fails to deïonize completely and acts to continue the arcing.

In this short article it is impossible to deal adequately with the many factors affecting safe breaker operation, but enough has been written to show the complications which the many factors introduce and to indicate that a great deal of study is still required before we have the ultimate in breaker construction.

Breakers can be improved and will be, but the operating requirements make the construction more and more difficult with each added condition to be fulfilled.

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GOOD-WILL SERIES

Speedy Rectification of Damage to Customers' Property*

By H. A. MARTIN
Chief Engineer Peoples Light & Power Company

A few days ago a public service employee of my acquaintance in the metropolitan area called at the residence of a customer to do some work on the consumer's equipment. The employee accidentally slipped and in falling a tool went through a pain of glass. Although the company's service in this repair or adjustment work on consumer's equipment was without charge to the consumer it was important that the broken glass be promptly replaced also without charge, which was done within a few minutes.

Whenever a customer's property is purposely or accidentally damaged the customer should at once be notified and repairs made where possible. If it is necessary to call for a carpenter or other mechanics to repair the damage the nearby management should be notified and a mechanic at once dispatched to make the necessary repairs. By notifying the customer that some of his prop-

**One of a series of utility instruction sheets developed by the Peoples Light & Power Company to bring about greater consideration of customers' interests.*

erty has been damaged you immediately bring him into your confidence and get his appreciation that the company is trying to do the right thing.

Sometimes during construction work mistakes are made so that consumers' motors or cooking and lighting equipment are damaged. In such cases where this covers a wide area immediate steps should be made to replace all damaged electric equipment and as rapidly as possible the consumers should be advised. Any work on a consumer's equipment should be done with his knowledge and consent.

In cases where phase changes or voltage changes are made which might affect the consumer's apparatus it is well to notify him in advance of the changes and request that the company be notified of any damages or failures in operation. In case these conditions are likely to cover a wide area the notification may be made through the columns of a newspaper, otherwise by telephone. The service men and engineers of the company should be ever ready to advise the consumer in regard to equipment changes and willing to accept responsibility for damages where they are not blameless. In cases where the employees of the company accidentally caused equipment damages the worry and trouble of replacement should be assumed by the company.

Prevent harm to the consumer's property, inform him in those instances that his property is damaged, repair the damage at once and keep him informed about it.

Take the consumer into your confidence about such matters and he will take you into his confidence. Thus you may personally make a friend and secure his good will toward the company.

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Merchandising Policies

Culminating many months of intensive study, a special committee of the Pacific Coast Electrical Bureau has handed in its report on merchandising policies. It is here reprinted. The Pacific Coast Electrical Bureau is maintained by the electrical industry of California in the interests of industry co-operation and better service to the public. It is under the joint management of the managing director of the Pacific Coast Electrical Association, a geographic division of the National Electric Light Association

FOUR considerations influenced the Pacific Coast Electrical Bureau to appoint a special committee for the purpose of studying the problem of dealer relations and utility merchandising plans and policies in California. These were:

1. The bureau's policy to bring about a better understanding of the duties of each branch of the electrical industry to the other branches.

2. The bureau's aim to cause the individual employees of the manufacturer, wholesaler, contractor, power company and merchandiser to have a better knowledge of their proper attitude toward companies and individuals in other branches of the industry.

3. The bureau's policy to encourage power companies to conduct their electrical merchandising activities on a basis that will stimulate retail dealers and contractors of their respective territories to become more active and progressive in promoting better and more extensive use of the services of the electrical industry.

4. The bureau's policy to promote continued development of the electrical industry by educational methods, fostering good ethical business standards and improved service to the public.

The board of directors appointed a special committee for this purpose, consisting of the following: H. M. Crawford, chairman; G. E. Arbogast, R. G. Kenyon, H. H. Courtright and K. I. Dazey.

This committee held several meetings from August to November, inclusive, 1930, and presented its report to the Electrical Bureau in November, 1930. Appreciating sincerely the fine work which was done by this special committee, the board of directors of the Pacific Coast Electrical Bureau adopted the following recommendations, based on this committee's report and consistent with the above outlined policies:

Uniform Standard for Range Wiring.—The bureau is in thorough accord with the adoption of a uniform standard for range wiring where local ordinances permit. We have been assured of the hearty co-operation of the contractor-dealer group and of the Pacific Coast Building Officials' Conference in bringing about a uniformity of local ordinances.

This particular problem of uniform standard is one in which the entire industry is interested and the plan should have united support.

Range Installation Prices.—The bureau does not feel that it should be charged with the responsibility of the adoption of a uniform minimum range installation price, because of variability of conditions and differences in ordinances. Furthermore, this is a question of individual company policy.

The bureau does, however, strongly urge that each power company for itself adopt a uniform price in each of its districts or in each territory where conditions of installation are comparable, this uniform price to be based on actual cost of labor and material plus a fair allowance for overhead and profit. The adoption of such uniform installation prices would enable the salesmen of the power company to quote definite figures when presenting range proposals to customers, and consequently facilitate range sales. It would also avoid misunderstandings, confusion and customer discontent which

ofttimes ensue from the quotation of estimated prices. Consequently, we believe the adoption of this practice by individual power companies would make for better and more satisfactory service to their customers.

Distribute Range Wiring Business to Established Contractor-Dealers.—The bureau is of the opinion that the established contractor-dealer is entitled to the support not only of the power company but of the jobber as well. We recommend that the power companies in placing wiring business give every possible consideration and preference to the established contractors and dealers who are actively promoting high ethical standards and adequacy and quality of electrical wiring. Our recommendation in this instance is based upon the conviction that if the electrical contractor-dealer branch of the industry is conducted upon a highly ethical and profitable basis and is given the support which it should have it will be so strengthened that it will have greater ability to promote the welfare of the industry through improved service to the public.

Quoting Prices on Wiring.—Again to avoid misunderstanding, confusion and customer discontent which frequently follow the quotation of estimated prices for range installations, we believe that where power companies do not adopt the uniform installation prices suggested in paragraph two, but turn the installation over to be handled direct by contractors with the consumer, prices should not be quoted until the authorized quotation is secured from the electrical contractor who is to do the work.

Allowances on Old Ranges.—The bureau is in accord with the discontinuance of exorbitant allowances, although it recognizes that in meeting certain types of competition this practice may sometimes be forced upon the industry. The bureau believes, however, that where such conditions necessitate large allowances, the power company in making them should give every possible consideration to the position of the dealers.

Installment Sales.—All responsible dealers are in a position to finance their own installment contracts and it cannot be expected that the power companies should extend financing terms to dealers who, because of their lack of responsibility, are unable properly to finance their installment contracts.

The bureau recommends that the power companies should continue to adhere to standard commercial practice in the carrying of installment contracts.

Dealers' Appliance Prospects.—It would appear to the bureau that, through previous misunderstandings, a mutual distrust on the part of the dealers' and the power companies' representatives had arisen. We believe unqualifiedly that the dealer's position should be recognized on an ethical basis in connection with legitimate prospects, including red seal applications, which he may develop and file with the power company. This, we are confident, will do much to re-establish a mutual confidence and a beneficial relationship.

Industry Co-operation. — The bureau feels that it would be derelict in its duty if it did not urge upon the commercial leaders in the entire industry the necessity for the re-establishment and maintenance of the former close personal contacts which existed among the various groups composing the electrical industry. We recognize, of course, that with the growth of the industry, these close contacts have become increasingly difficult, but we also feel that much of the misunderstanding in the past is directly attributable to the lack of these intimate contacts.

It is the opinion of the bureau that much of this misunderstanding has arisen through lack of co-operation, and we cannot urge too strongly a close bond of fellowship between the district and division representatives and the sales organizations of the power companies and the local dealers. In this connection, it is extremely gratifying to note that considerable progress has already been made along these lines. We feel, however, that we cannot stress too strongly the necessity for continued contact and co-operation between the two branches of the industry.

The bureau plans to continue its activities which will help toward the accomplishment of this much-to-be-desired result.

Foremost among these is the plan of having group meetings periodically for the purpose of personal contact and interchange of common problems.

Inform Dealers in Advance of Major Merchandise Programs.—We believe that representative dealers in electric appliances should be informed in advance of the actual carrying out of merchandising plans. Through this means the power companies will be enabled to secure a whole-hearted co-operation on the part of the dealers and the latter, in turn, will be enabled to participate fully in such merchandising plans to the mutual profit of both the dealer and the power company.

Salesmen's Compensation.—The question of sales compensation has received the careful thought and study of each member of the bureau. Initially, we had hoped to be able to submit a general recommendation which would solve this problem satisfactorily. Both research and discussion, however, made it highly apparent that because of variations in local conditions the establishment of any specific plan to apply throughout the entire system of any one of the power companies was not practicable. For this reason it became obvious that it would be increasingly difficult to attempt to establish a standard basis of compensation which would apply to the entire state.

The bureau feels, however, that much of the past misunderstanding throughout the entire country has arisen because of the fact that the income of power company salesmen is either partially or entirely dependent upon volume of merchandise sales in dollars and cents, and that because of this condition it has been difficult to exercise a satisfactory control over salesmen compensated on this basis.

Recognizing the impracticability of adoption of a statewide basis of compensation for salesmen, and at the same time realizing the unfair competition frequently resulting from the commission form of compensation, we urgently recommend the following:

(a) That the sales plans and policies of each California utility conform to ethical, constructive merchandising methods, on such a basis as will encourage sales activities of electrical merchandise dealers.

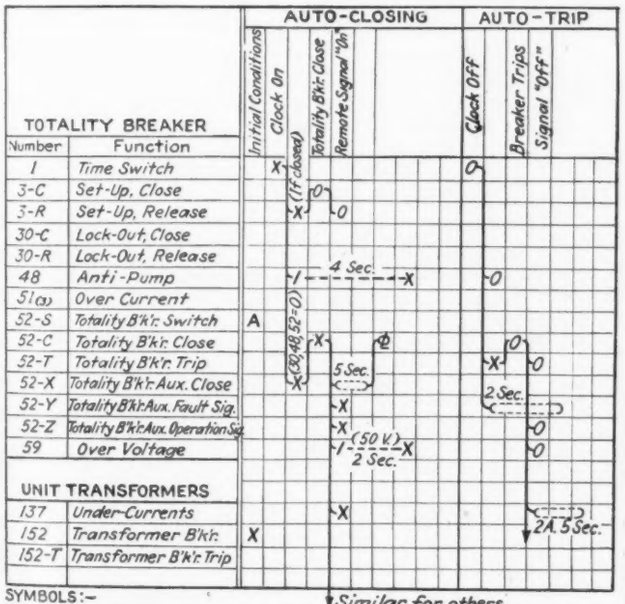
(b) That the compensation of utility salesmen be established on a basis which will encourage their full and hearty co-operation with such electrical merchandise dealers.

Sequence Chart Traces Complete Relay Operations

By WILLIAM W. EDSON
Station Engineering Department,
Edison Electric Illuminating Company of Boston

A compact sequence chart designed to facilitate studying the cause and effect of each relay operation has been developed by the Boston Edison Company and found useful in expediting the derivation of new automatic control diagrams. Time delay on closing or opening, relay current or voltage settings and uncompleted operations may be shown directly at the point where applicable. The chart has the attributes of a slow-motion picture which can be stopped as desired. Thus, the chart can be entered at any point, and by glancing to the left one may easily determine the correct position of all relays. This is especially important in studying a new diagram as one can take up the picture conveniently after an absence of several days.

In maintenance work the chart is convenient as trouble can be bracketed by inserting paper under the contacts of a relay and allowing the operation of the equipment to follow the chart up to that stopping point. By entering the chart at suitable points the trouble is readily located.



Improved sequence chart for checking relay operations

This sequence chart represents the operation of the equipment described by W. H. Colburn in an article on "Automatic Time Control for Constant Current Transformers" on page 202 of this issue. The usual types of sequence chart illustrate wide variations in make-up and numbers for different classes of service. The chart illustrated shows the cause and effect of each relay operation. Numbers in parentheses written vertically above an operation indicate the interlocks involved in that particular operation. The remarks at the top of the chart summarize the main operations. Devices may be listed in the order of their normal sequence of operation or by their function numbers as adopted in the A.I.E.E. Standards No. 26.

Effect of Surroundings on Modern Lighting

By M. LUCKIESH
Director Lighting Research Laboratory,
General Electric Company, Cleveland, Ohio

Methods of supplementing general lighting with high illumination levels for the individual workplace offer many advantages and are being adopted to some extent. As a consequence, questions concerning the influence exerted by the less-bright surroundings frequently arise. In general, the influences exerted by the surroundings are of primary importance when viewed from the psychological standpoint, but usually they are of secondary importance from the narrower viewpoint of visual efficiency. In some cases, however, there are exceptions to this general statement.

In estimating the possible influence which surroundings exert upon seeing, it is necessary to consider at least four primary factors:

1. The extent, or size, of the immediate field in which critical seeing is required.
2. The ratio of the brightness of the immediate field to that of the surroundings.
3. The influence of the surroundings upon vision entirely within the immediate field.
4. The influence of the surroundings where seeing and consequent adaptation are required in both the immediate field and in the surroundings.

If the extent of the immediate visual field is greater than 30 deg. in visual angle the influence of darker surroundings is not important for seeing within that field. If critical seeing is also required in the darker area the brightness ratio between the two must be considered. In general, a brightness ratio of ten to one between the immediate field and the surroundings can be tolerated if the brightness level of the surroundings is adequate for the work demanded. The brightness ratio permitted by good practice will depend upon the relative amount of visual work required in each field and upon the frequency with which the eyes are required to shift from one brightness level to another.

If the immediate visual field is less than 30 deg. in extent the influence of the darker surroundings is a distinct handicap to clear seeing, even if it were possible to keep the eyes fixated upon objects within the immediate field. In some cases, such as the lighting of the immediate area about the needle of a sewing machine to a high level of illumination, it would be impractical to illuminate large surrounding areas to the same level. The disadvantage of the darker surroundings, however, is more than offset by the aid to vision afforded by the high intensity of illumination at the place where critical seeing is demanded. On the other hand, if the eyes must shift frequently between the two fields, the gain in visibility may eventually prove to be unimportant in comparison with the fatiguing effect upon the eyes produced by frequent readaption to different brightnesses.

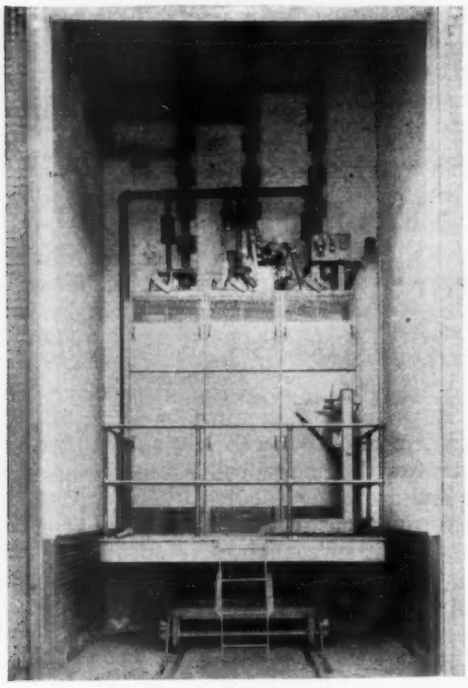
1,325,000 Kva. for Te

By CARROLL M. WILLIAMS
Switchboard Engineering Department
Westinghouse Electric & Manufacturing Company,
East Pittsburgh, Pa.

TESTS of circuit breakers and other electrical equipment under short-circuit conditions of greater severity than that generally encountered in actual service on the largest power systems may now be made at the East Pittsburgh a.c. high-power laboratory of the Westinghouse Electric & Manufacturing Company.

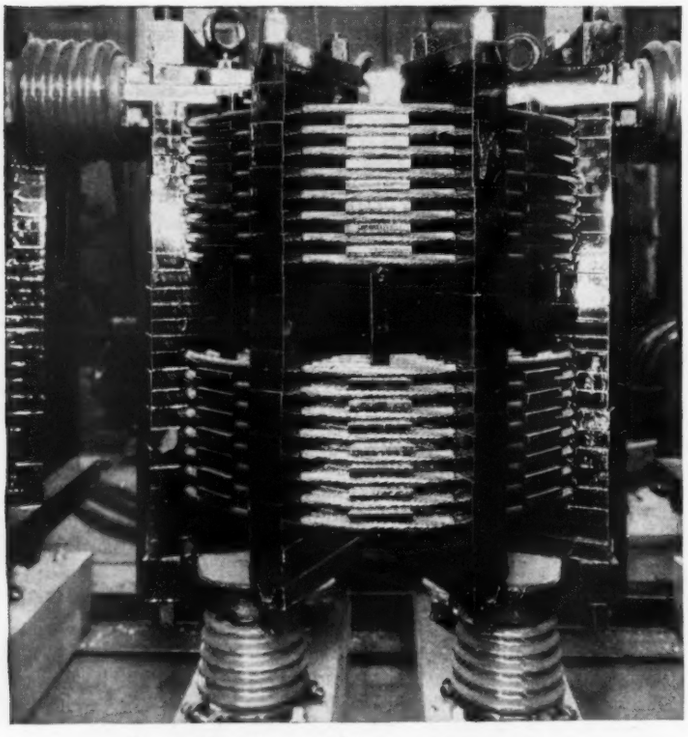
The combined three-phase rating of the generators, the second of which has recently been installed, is 100,000 kva. at 13,200 volts, 60 cycles or 11,000 volts, 25 cycles. The units may be operated independently or in parallel at sustained test voltages ranging from 3,170 to 220,000, the higher values being obtained by use of special step-up transformers. The short-circuit currents are of very high values due to especially designed low reactance machines and circuits. Asymmetrical instantaneous peak currents as high as 201,000 amp. are obtainable. The instantaneous peak symmetrical short-circuit

(*Continued on page 200*)



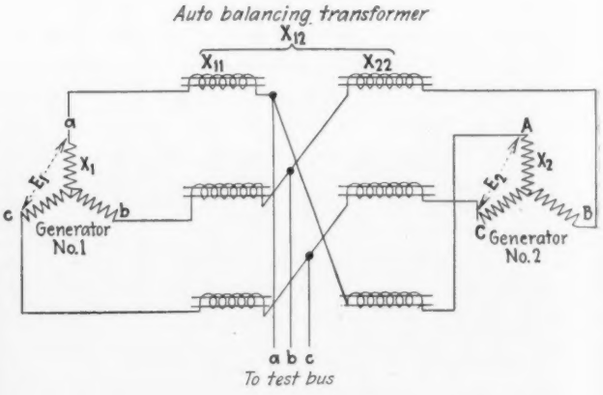
Closing-in breaker handles heavy service

This closing-in breaker completes the circuit to the apparatus on test and is subjected to severe duty. For this reason provisions have been made to facilitate repairing of contacts and changing of oil. No arcing tips are provided as the breaker control circuit is so interlocked that this breaker will never open on short circuit. A two-story control and observation station is located a safe distance from the test vaults.



Strong bracing used in reactor structure

There are three tiers of six reactors, which are especially braced by insulators to withstand the heavy stresses produced by short-circuit currents. Various values of reactance may readily be obtained by series or parallel connections.

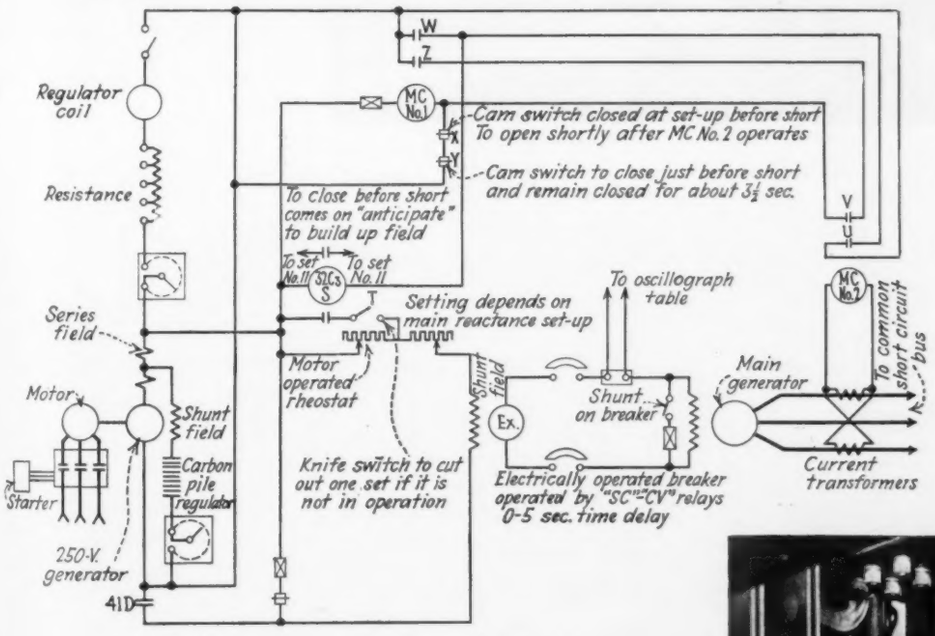


Arrangements for paralleling old and new generators

The parallel operation of two generators of different capacities, mass and electrical characteristics, under short-circuit conditions, offered several unique problems that had to be solved to insure synchronism during the period of test. The two generators have different values of deceleration, the smaller machine having greater proportionate losses as well as less stored kinetic energy to draw from to hold up its speed. If no provisions were made to insure that synchronism be maintained between the two machines, they would drift apart 1,719 electrical degrees in one second. During this time, if the machines are paralleled for obtaining their combined capacity for testing, the resultant current would oscillate between the short-circuit current of the smaller generator and the combined short-circuit current of the two machines. There would be no assurance that the breaker on test would open when the current was at a maximum.

By placing an external reactance between corresponding phase windings of the two machines, the effective transient reactance of the two machines is altered so as to cause synchronizing power to flow from one machine to the other, depending upon the difference in phase-angle displacement.[2] The magnitude of this synchronizing power is a direct function of the mutual reactance of the two windings. The transformer is designed with double windings and connections changed to maintain proper value of mutual inductance. Air gaps are provided so that the exciting current is essentially a straight line.

Testing Equipment to Destruction

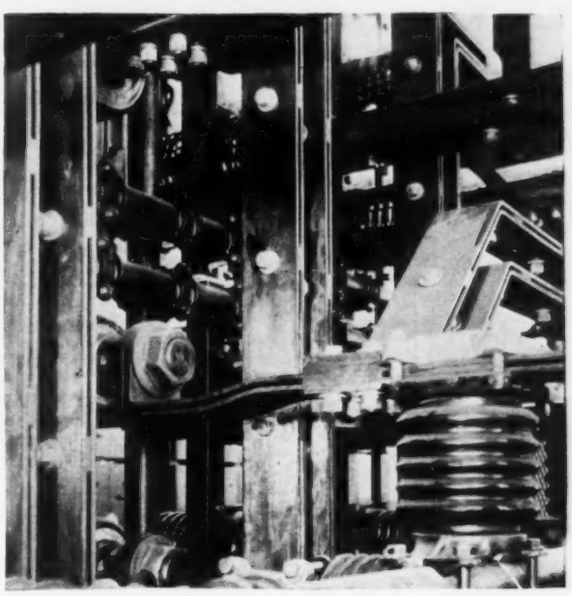


Quick-response excitation a feature

To prepare for a test, contacts on the test sequence cam switch are adjusted by a micrometer device, so that there is a positive relation between contacts marked *X* and *Y* and the contacts operating the "closing-in" breaker to the short, this "anticipation" of contact *Y* depending upon the accumulative time constant of the fields of the exciter and of the main generator. In testing knife switch *T* is closed in series with the contact on relay *32C3S* and the cam switch motor energized. Contact *X* is closed some time before contact *Y*, but is arranged to open immediately after relay *MC2* is energized by flow of the short-circuit current. Contact *Y* then is closed in proper relation to the "closing-in" breaker, and relay *MC1* becomes energized, closing contacts *W* and *Z*, which in turn energize relay *32C3S*. This latter relay closes contact in series with knife switch *T*, and the exciter field is overshot by the shorting out of the motor-operated field rheostat, which, in turn, overexcites the main generator to maintain constant flux, and the test is in progress. As short-circuit current flows, relay *MC2* becomes energized, closing contacts *U* and *V*, contact *U* holding in relay *32C3S* independently of contact *W* on relay *MC1*, and contact *V* holding in relay *MC1* independently of contacts *X* and *Y*. Since contact *X* has now opened (after relay *MC2* becomes energized) contact *V*, directly dependent upon the flow of short-circuit current, is the only holding medium for relay *MC1*. This relay is held in during the test to guard against faulty operation of contacts which might cause a "pumping" action. Thus, *MC1* acts as the set-up relay and *MC2* as the cut-off device. Providing the equipment on test clears the short satisfactorily, relay *MC2* de-energizes, contacts *U* and *V* open, relays *MC1* and *32C3S* in turn become de-energized and their contacts open, cutting off the overshooting of the exciter field by cutting in the field rheostat. The equipment is then ready for another cycle of testing.

Hollow square buses with 4,000-amp. capacity

To permit "load-back" tests the bus section between the generator switch group and the transfer switches is designed for the full generator capacity, being made in the form of a modified hollow square with a 2½-in. spacing.



current corresponds to 1,325,000 kva. and the sustained short-circuit current corresponds to approximately 550,000 kva. The tremendous power that is delivered during short-circuit tests is dependent upon the flywheel effect of the generator, the rotor weighing 275 tons.

Oscillographs make as high as eighteen different records of important information such as time, line voltages, line current, travel and position of contacts, record of pressure, arcing voltages across contacts, the closing and tripping current, etc. A moving picture camera is included, and the slow-motion pictures of the tests may be projected for detailed observation. From these same films permanent records are obtainable.

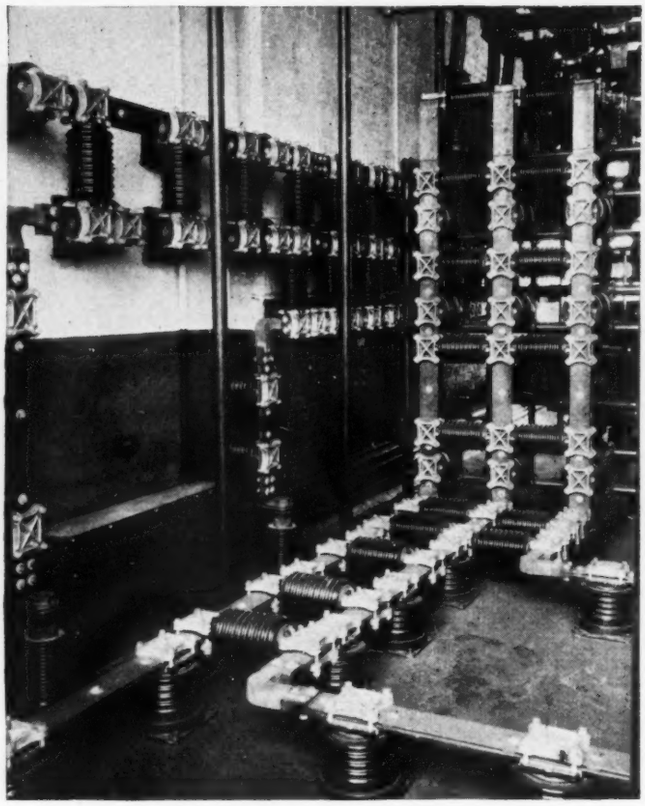
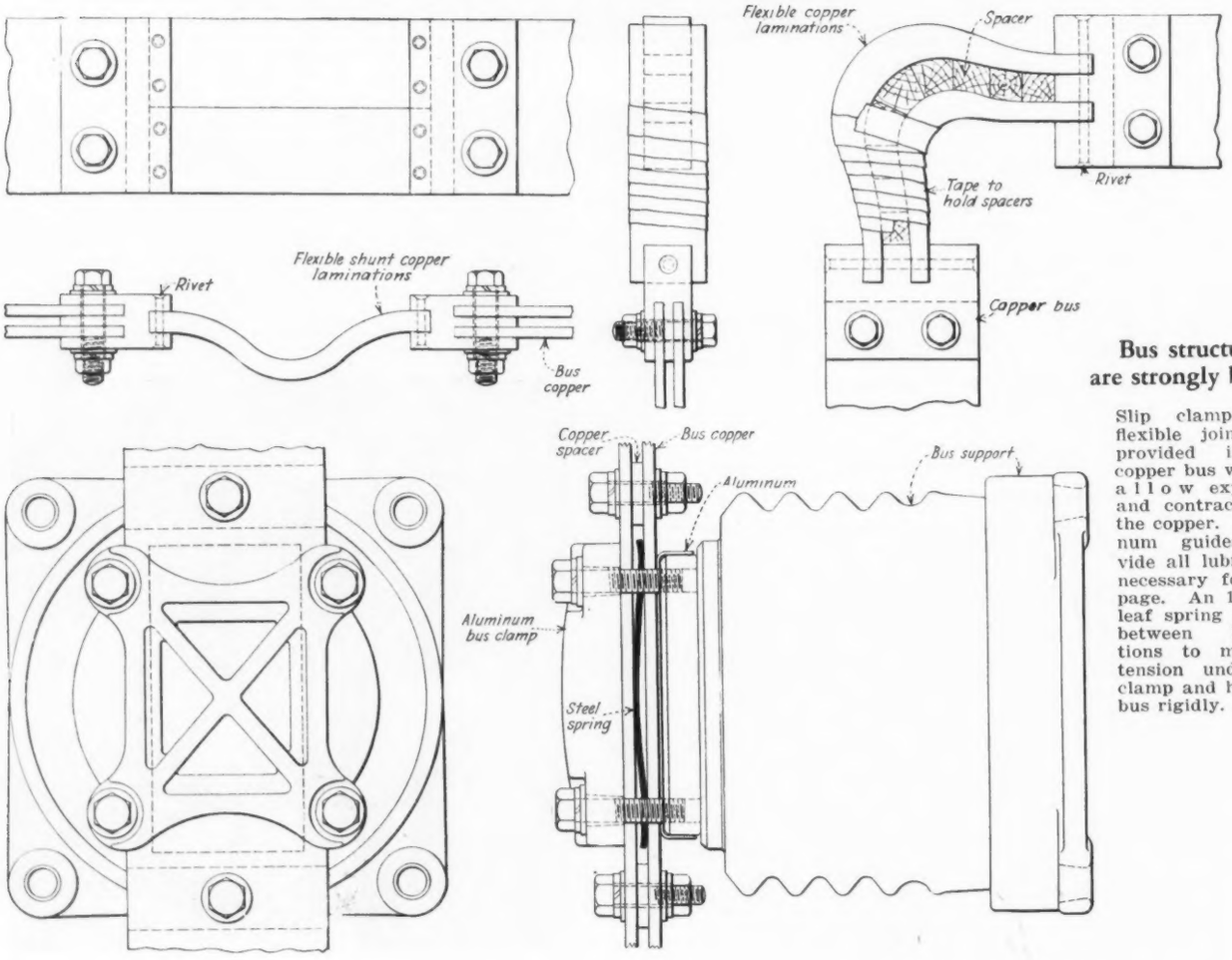


Photo glow tubes sensitive to light keep an ever-watchful eye on all parts of the equipment and operate relays to protect against damage due to arcing at any place about machines and circuits. Safety switches located at test vaults are under the sole control of the man in charge of the test set-up crew. Gate and door interlocks, alarms and signal lights are also provided as safety features.

Rather elaborate facilities are provided for reconditioning the insulating oil used in circuit breakers on test, as repeated short circuits subject the oil to far more severe duty than is experienced in service.



Bus structures are strongly braced

Slip clamps and flexible joints are provided in the copper bus work, to allow expansion and contraction of the copper. Aluminum guides provide all lubrication necessary for slippage. An 1,100-lb. leaf spring is used between laminations to maintain tension under the clamp and hold the bus rigidly.

Determining Large Three-Wire Lighting Meter Constants

By HAROLD W. KING

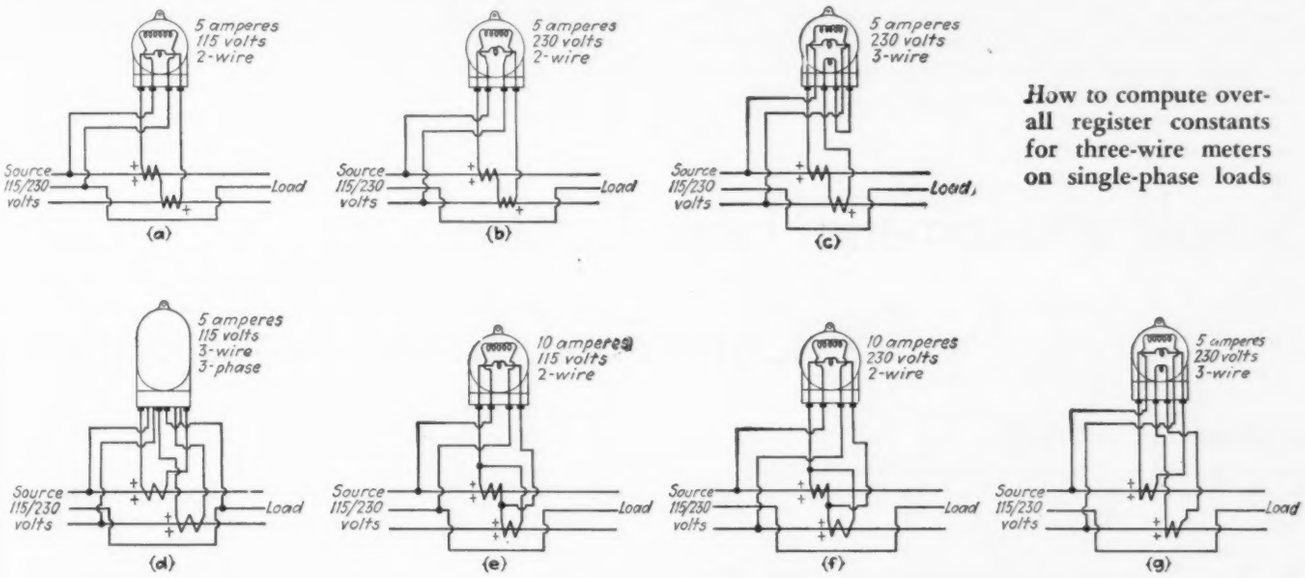
Sangamo Electric Company, Birmingham, Ala.

GREATER confusion and uncertainty prevail in the assigning of proper register constants to large single-phase meters connected to current transformers than to the general run of more complicated polyphase installations using both potential and current transformers.

The purpose of this article is to present a simple but infallible method of determining or checking dial constants in cases where self-contained meters with a dial constant of one (1), obviously properly trained for their nameplate ratings, have been, or may be, used with current transformers and then had a new multiplying constant assigned and marked on the dial in the meter shop of the utility.

This is best illustrated through an analysis of the following representative installations wherein commonly well-known schemes have been chosen for emergency or permanent use, which comprises seven different combinations. Due to the comparatively large number of errors in constants which have been disclosed among such hookups it appears that some accurate formula should be

How to compute overall register constants for three-wire meters on single-phase loads



(a) Case I—Single-phase watt-hour meter with three-wire current transformer—It should be observed that the new dial constant, 160, *is not* the ratio of the current transformer, but is *twice* its ratio.

(b) Case II—Single-phase watt-hour meter with three-wire current transformer—Applying the evolved formula, we have in this case 92,000 divided by 1,150 times 1 which is equal to 80, or the correct dial constant. In this instance it should be noted that the new dial constant of 80 is the ratio of the current transformer.

(c) Case III—Single-phase watt-hour meter with independent potential, with three-wire current transformer—The formula indicates that the new dial constant for this more or less special connection is 80.

(d) Case IV—Polyphase watt-hour meter with two two-wire current transformers—The formula is equally applicable in this case, wherein the new dial constant is 80. Since a two-element polyphase meter is used we have the equivalent of two single-phase watt-hour meters, hence our formula takes this form,

$$\frac{92{,}000}{575 \times 2} \times 1 = 80$$

This combination is the most accurate of all the cases cited and is widely used on important installations where the revenue involved is large.

(e) Case V—Single-phase watt-hour meter with two two-wire current transformers—The new dial constant in this instance is 80. The fact that a 10-amp. meter is used does not alter the dial constant, since the meter is properly trained for its 10-amp. rating at 115 volts.

(f) Case VI—Single-phase watt-hour meter with two two-wire current transformers—It should be noted that while the dial constant of 40 in this case is one-half the ratio of the current transformers, the fact that a 10-amp. meter is used does not influence the dial constant, since the meter is properly trained for its self-contained rating.

(g) Case VII—Single-phase watt-hour meter with independent potential, with two two-wire current transformers.—The dial constant for this rather unusual connection is 80 and is cited merely to illustrate the puzzling problems which may be solved through the use of the formula.

adhered to in assigning dial constants on any of these schemes.

In the following examples let it be assumed that the meter selected has been correctly assembled, calibrated and trained as marked on its nameplate (this rating being indicated at the right of the meter in each figure), and that in each case, for clarity, we use either a 400- to 5-amp., three-wire current transformer or else two 400- to 5-amp., two-wire current transformers.

To evolve a formula equally applicable to any or all of these installations let us assume that full load current is flowing through the transformer in Case I. Referring to (a) in the accompanying illustration, let us call the load "Primary Va," which would actually be 92,000 volt-amperes, since we are assuming full load in the circuit at the voltage indicated. The watt-hour meter, as connected, receives a load of 5 amp. and is supplied with a potential of 115 volts; it is therefore running approximately full speed forward on 575 volt-amperes, which we shall call "Meter Va." The register constant, K_r, is of course unity, being proper for the meter when used self-contained.

Therefore, $\frac{\text{Primary Va}}{\text{Meter Va}} \times K_r = \text{new dial constant.}$

Substituting, $\frac{92{,}000}{575} \times 1 = 160$ (correct dial constant).

Let us refer to the installations which fortunately predominate, where the meter and the transformer, or transformers, were originally supplied by the manufacturer, assembled, trained and marked for the actual primary rating of the load to be metered. It might be well to include an illustration of how our formula may be applied in such instances where a different capacity of current transformer has been installed, but where the meter is left as originally furnished as regards coils and register ratio. Obviously, a new dial constant must be used to fit the altered transformer capacity.

Suppose that we select an installation where a 150- to 5-amp., three-wire current transformer has been connected to a meter marked and trained for 150 amp. at 230 volts, the meter having a register ratio of 100, a disk constant of 20 watt-hours and a dial constant (K_r) of 10. To take care of an increased load the 150- to 5-amp. current transformer has been replaced by one having a rating of 400 to 5 amp. Remember that the meter is marked and trained for the original transformer rating, therefore the "Meter Va" remains the same, or 34,500. Applying our formula,

$$\frac{\text{Primary Va}}{\text{Meter Va}} \times K_r = \text{proper dial constant.}$$

Therefore, $\frac{92{,}000}{34{,}500} \times 10 = 26\frac{2}{3}$.

Hence, in conclusion, it may readily be observed that if the investigator will set down any connection diagram of a single-phase, three-wire metering installation using the actual rating of the meter and of the current transformer, or transformers, in such cases not covered in this article, he may in any instance, by applying the suggested formula, easily and surely arrive at the correct register constant.

▼ ▼ ▼

Simple Automatic Time Control for Constant-Current Transformers

By WELLEN H. COLBURN

Station Engineering Department, Boston Edison Company

MANY methods of constant-current transformer control are open to engineers, but when a group of these units is installed in an automatic station without ready means of supervision the nearest approach to attendant group operation is some time device, which may be any contact-making or circuit-closing time switch.

The control scheme described here has been devised to meet the following operating requirements: (1) Start at predetermined time and continue to operate until (2) cut out, at predetermined time; (3) cut out and lock out an individual transformer or the main breaker in event of electrical failure in the one or in the totality circuit; (4) cut out a transformer in event of low current (and consequent high voltage) on street circuit; (5) start or cut out at any time by roving operator independently of automatic control; (6) start by roving operator ahead of schedule with regular cut-out by automatic control; (7)

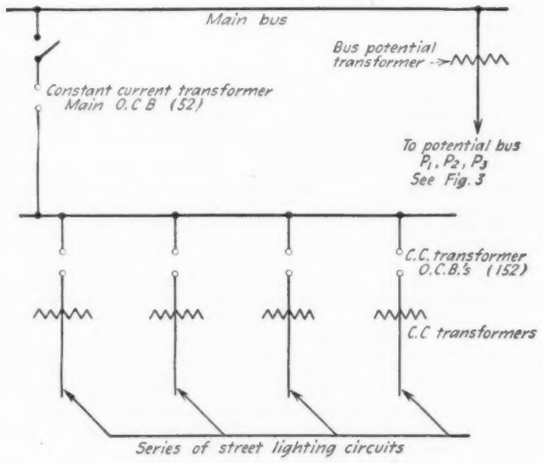

Main bus
Bus potential transformer
Constant current transformer Main O.C.B (52)
To potential bus P1, P2, P3 See Fig. 3
C.C. transformer O.C.B.'s (152)
C.C transformers
Series of street lighting circuits

Fig. 1—Scheme of energy supply to street-lighting circuits

remote signal to indicate "Operation," "Non-operation" and "Fault"; (8) prevention of breaker "pumping."

The control scheme provides for closing and opening a main high-tension supply (totality) oil circuit breaker, 52 (Fig. 1) under control of a time switch. This may be actuated by a sidereal timepiece, or oftener, because of

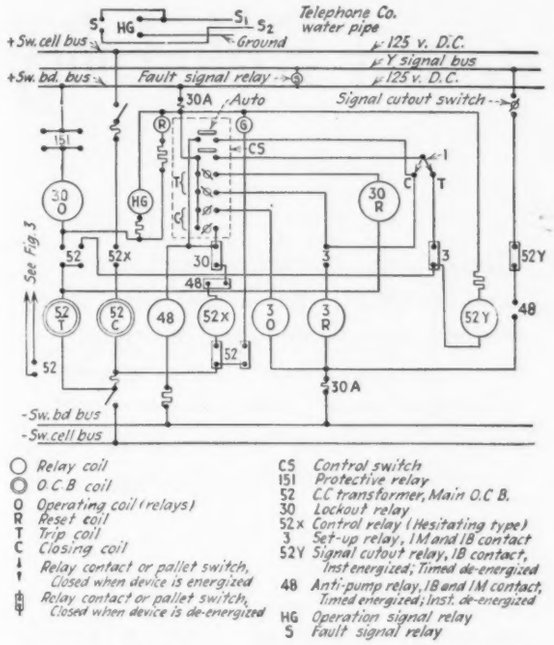


Fig. 2—Method of controlling totality breaker, showing relay set-up for automatic and manual operation

the lesser cost, by a simple time clock with adjustable settings periodically adjusted by a roving operator who must regularly visit the station for other purposes. The breaker closed energizes a bus to which are connected several constant-current transformers, usually of the high-reactance automatic station type, although the older low-reactance type may be modified and adjusted to serve nearly as well. The manually operated high-tension primary breakers, 152, of these tubs remain closed with street-lighting circuit switches plugged in. The control and protective scheme for breaker 52 and the protective scheme for each (152) breaker are shown in Figs. 2 and 3, respectively.

In the totality breaker control diagram, Fig. 2, a single-pole, double-throw time switch (1) is used. Relay 30 locks out main breaker 52 if tripped by protective relays 51, as does also relay 48, to prevent the breaker's "pumping" in event of mechanism failure. Signal relay 52Y provides remote indication of fault and signal relay HG of scheduled operation.

The control consists essentially of a control switch having a "manual" and an "automatic" control position. "Automatic" control is secured by pulling the switch handle. In this position the switch energizes the time switch (1), which, by means of relay 52X, energizes the closing coil of totality breaker 52C and closes it. This starts the constant-current transformers and lighting circuits, which later are shut down by the time switch energizing breaker trip coil 52T. Relay HG signals a remote station as long as the breaker is closed.

Occasionally operation is desired for "Test" or for "Off-schedule" requirements, such as unusual darkness due to storms or an eclipse, or to cut out the street lighting on account of accidents or hazard to firemen fighting fires. This requires that manual control be assumed regardless of the position of the time switch. The control switch and set-up relay, 3, afford this feature. Manual control is restored by releasing the control switch to "manual" position, when it can be rotated for "close" or "trip" in the usual electrical remote control.

Occasionally local authorities request the starting of lights ahead of schedule owing to early darkness. A roving operator takes the control switch off "automatic," closes the breaker, starting the transformers and lights, restores the switch to "automatic," and leaves, assured that at regular cut-out time the time switch will assume control and shut down the equipment. The set-up relay also makes possible this feature.

Each constant-current transformer is equipped with instantaneous overcurrent protection on the primary side and undercurrent protection on the secondary side (Fig. 3). The first protects against a transformer fault, the second prevents dangerous circuit voltages in event of broken wires or other current reduction. Minor temporary circuit or supply disturbances may cause unnecessary operation of the latter feature, hence a time-delay undercurrent relay, 37, is used to bridge such transient low-current periods. However, during the shut-down and the starting periods this relay has its contacts closed, therefore it is necessary to introduce a relay, 59, to interrupt the trip circuit when the main breaker 52 is open or the supply voltage fails. This is a voltage relay

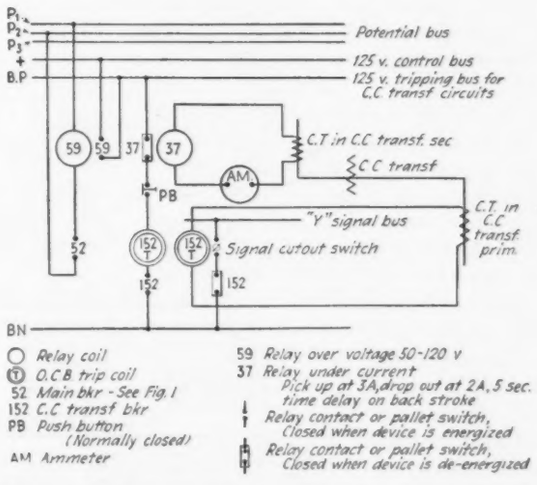

P1
P2
P3
B.P
Potential bus
125 v. control bus
125 v. tripping bus for C.C transf. circuits
C.T. in C.C transf. sec
C.C transf
PB
AM
"Y" signal bus
C.T. in C.C transf. prim.
Signal cutout switch
52
152
BN
Relay coil
O.C.B trip coil
52 Main bkr - See Fig. 1
152 C.C transf bkr
PB Push button (Normally closed)
AM Ammeter
59 Relay over voltage 50-120 v
37 Relay under current Pick up at 3A, drop out at 2A, 5 sec. time delay on back stroke
Relay contact or pallet switch, Closed when device is energized
Relay contact or pallet switch, Closed when device is de-energized

Fig. 3—Relay set-up to protect constant-current transformers from overcurrent and undercurrent conditions

actuated from the bus potential transformer through an auxiliary switch on the main breaker (52) (or directly, if available, from potential transformers on the constant-current transformer bus), with sufficient time delay on closing to insure the undercurrent relays opening their contacts before this relay closes the tripping source.

This automatic control has proved very successful, as well as being simple and inexpensive and affording means to meet almost any operating condition.

Protection and Dispatching for Greatest Reliability*

By N. B. HINSON and H. W. TICE

Chairman System Planning Committee and Operating Engineer, Respectively Southern California Edison Company Ltd., Los Angeles, Calif.

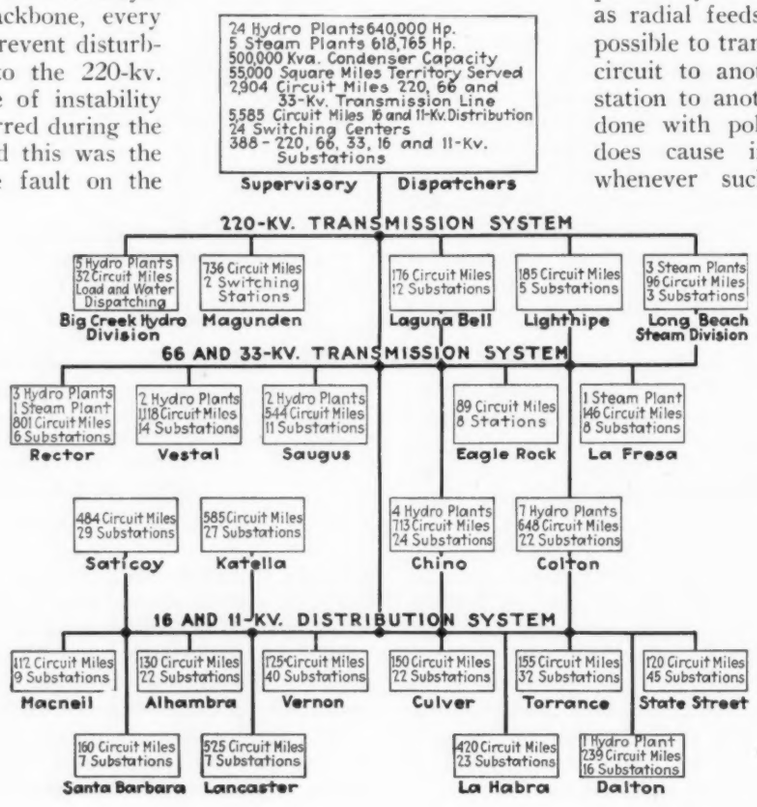
Dispatching, protection and communication are vital in any plan of major system planning and operation. In a previous article master system planning† was discussed. In this article it is shown how these additional factors enter into the plan.

STANDARDS of reliability of the highest order are expected of all equipment in order to meet the exacting requirements for continuity of service as established by the Southern California Edison Company, Ltd. The standards of service must of necessity be of the highest order due to the proximity and abundance of cheap natural gas. There is no preferred service to large blocks of power, so that the same standards of service must exist throughout the system.

The Edison system, as shown by the accompanying map, consists essentially of two major power-generating sources approximately 275 miles apart, connected by three 220-kv. transmission lines. The Big Creek hydro plants have a combined capacity of 385,000 kw. and at Long Beach there is 416,000 kw. in steam. Due to the complete dependence of the entire system on the 220-kv. backbone, every precaution is taken to prevent disturbance or interruptions to the 220-kv. system. Only one case of instability for 30 seconds has occurred during the last sixteen months, and this was the result of a three-phase fault on the 220-kv. system. In the event of such trouble steam and hydro are separated immediately and operated as separate systems until normal condition can be restored safely.

Interruptions to service as a result of 66-kv. troubles are rare due to the multiplicity of lines feeding the given load. The troubles are isolated without interruption to service. The 16- and 11-kv. distribution system is gradually being converted into one of multiple radial feeds or loop service so that interruption to service will not result from the majority of troubles experienced on the overhead system. This is particularly true in the large industrial and residential centers. In the agricultural areas practically all of the lines are operated as radial feeds, so designed that it is possible to transfer the loads from one circuit to another or from one substation to another. This, however, is done with pole-top switching, which does cause interruption to service whenever such switching is necessitated by trouble.

The fundamental plan of short-circuit control is one of sectionalizing the system into 75,000-kva. units at the 220- to 66-kv. major step-down substations. This limits the short-circuit kva. to approximately 750,000 on the 66-kv. system. On the 220-kv. system, where


24 Hydro Plants 640,000 Hp.
5 Steam Plants 618,765 Hp.
500,000 Kva. Condenser Capacity
55,000 Square Miles Territory Served
2,904 Circuit Miles 220, 66 and 33-Kv. Transmission Line
5,585 Circuit Miles 16 and 11-Kv. Distribution
24 Switching Centers
388 - 220, 66, 33, 16 and 11-Kv. Substations
Supervisory
Dispatchers
220-KV. TRANSMISSION SYSTEM
5 Hydro Plants 32 Circuit Miles Load and Water Dispatching
Big Creek Hydro Division
736 Circuit Miles 2 Switching Stations
Magunden
176 Circuit Miles 12 Substations
Laguna Bell
185 Circuit Miles 5 Substations
Lighthipe
3 Steam Plants 96 Circuit Miles 3 Substations
Long Beach Steam Division
66 AND 33-KV. TRANSMISSION SYSTEM
3 Hydro Plants 1 Steam Plant 801 Circuit Miles 6 Substations
Rector
2 Hydro Plants 1118 Circuit Miles 14 Substations
Vestal
2 Hydro Plants 544 Circuit Miles 11 Substations
Saugus
89 Circuit Miles 8 Stations
Eagle Rock
1 Steam Plant 146 Circuit Miles 8 Substations
La Fresa
484 Circuit Miles 29 Substations
Saticoy
585 Circuit Miles 27 Substations
Katella
4 Hydro Plants 713 Circuit Miles 24 Substations
Chino
7 Hydro Plants 648 Circuit Miles 22 Substations
Colton
16 AND 11-KV. DISTRIBUTION SYSTEM
112 Circuit Miles 9 Substations
Macneil
130 Circuit Miles 22 Substations
Alhambra
125 Circuit Miles 40 Substations
Vernon
150 Circuit Miles 22 Substations
Culver
155 Circuit Miles 32 Substations
Torrance
120 Circuit Miles 45 Substations
State Street
160 Circuit Miles 7 Substations
Santa Barbara
525 Circuit Miles 7 Substations
Lancaster
420 Circuit Miles 23 Substations
La Habra
1 Hydro Plant 239 Circuit Miles 16 Substations
Dalton

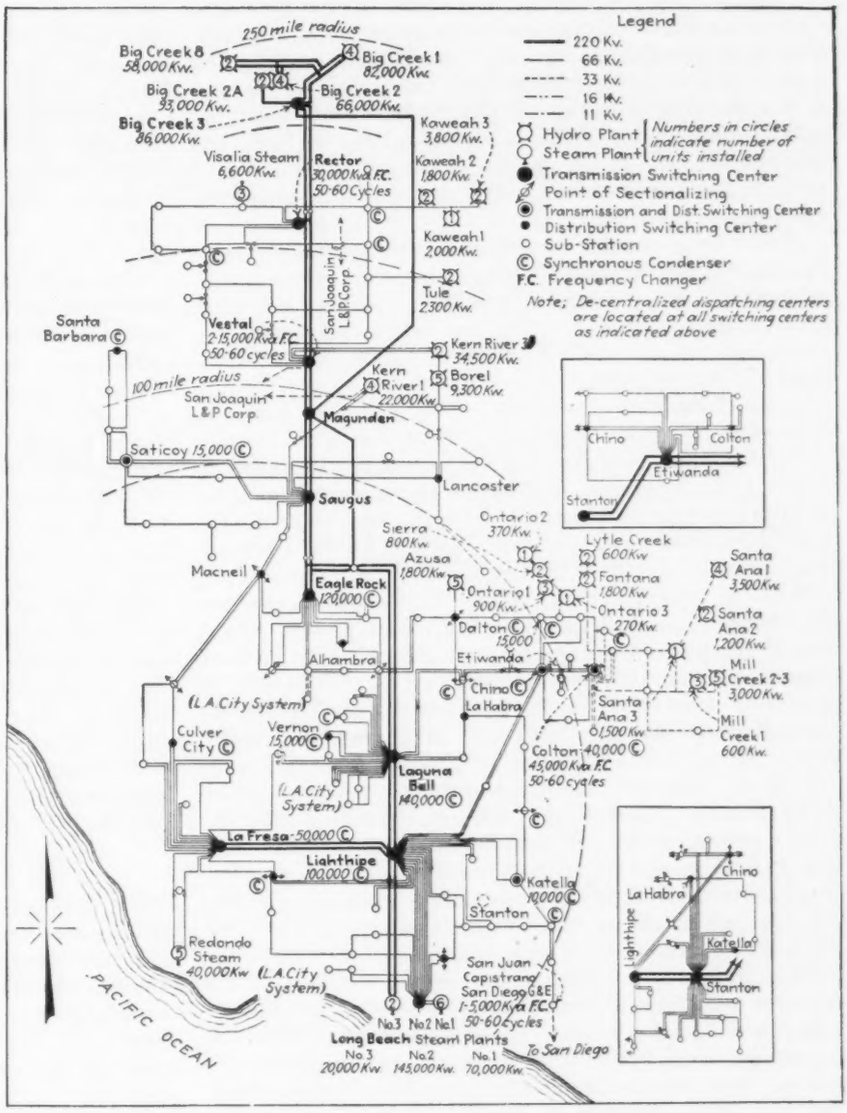
Decentralized dispatching organization

**Based on report presented before power systems engineering committee meeting.*

†"Master System Planning," ELECTRICAL WORLD, May 23.

Transmission system of the Southern California Edison Company, Ltd.

Showing switching centers at which are located decentralized dispatching points



faults are practically all phase to ground, the flow of ground current is being controlled by the installation of reactors on the high side neutrals of the 220/66-kv. transformer banks. On the 11- and 16-kv. system it is the policy to install reactors in each unit, and where the transformer capacity is of the order of 30,000 kva. further control is obtained by sectionalizing between banks on the low-voltage bus.

Prior to the time the severity of short circuits on the 66-kv. system was limited by sectionalizing these short circuits frequently produced instability of the 220-kv system. Since limiting the short circuit by sectionalizing no instability has occurred on the system from 66-kv. short circuits.

The scheme of relaying provides for removing faults from the system as quickly as possible. Generators, transformers and major station buses are all provided with differential protection. The 66-kv. sub-transmission lines are equipped with phase-balance and residual-balance relays for pairs of lines and directional overload and ground relays for single lines. The 220-kv. transmission lines are equipped with residual-balance relays for pairs of lines and directional ground relays for single-line protection. On the 220-kv. system relays are installed in duplicate, so that one set can be tested without removing the protection from the lines. Therefore tests can be made as frequently as desired without endangering the operation of the 220-kv. backbone.

On one section of the 220-kv. system an experimental carrier-current pilot protective scheme has been applied. This fundamental scheme for obtaining quick clearance will find a wider application in the future, particularly when it is developed to the point where it is capable of removing three-phase faults before instability occurs.

Single-line-to-ground faults on the 220-kv. system do not produce instability even under heavy load conditions. Short circuits involving more than one phase are likely to do so. However, there is a certain time interval before instability occurs, so that it appears that the use of high-speed protection and switches should eliminate the rare cases of instability produced by more than one phase of the 220 kv. becoming involved at the same time under heavy load conditions.

The insulation used on 220-kv. lines is thirteen units on suspension and fifteen on dead ends. Fog-type insulators are used throughout the fog belts. Shield rings are used on all the 220-kv. insulator strings. The insulation used on 66 kv. consists of five units on both the suspension and dead-end positions. In some of the dry valley areas four units are used on suspension. For 16-kv. lines 23-kv. insulators are used in the dry areas and 27-kv. and 45-kv. insulators in the fog belt. On 11-kv. lines 13-kv. insulators are used in the dry areas and 23-kv. and 27-kv. insulators in the fog belt. On the 11- and 16-kv. dead-ends one 7½-in. Hewlett insulator is used in the dry areas and two in the fog belt.

No lightning arresters are used on the 220-kv., but overhead ground wires are installed on all lines. On the 66-kv. lines lightning arresters have been installed on all lines at substations, but the company's policy has been changing and at a number of new substations arresters have been provided on the transformer banks only. No overhead ground wires are used on 66-kv. lines, and choke coils are being eliminated in all the substations. On the 16- and 11-kv. distribution lines lightning arresters are installed at the substation on all lines, but choke coils are being eliminated. Many of the new stations have underground getaways on the 11 and 16 kv. and the lightning arresters are installed on the first pole away from the terminal poles adjacent to the substation.

Decentralized dispatching as applied by the Southern California Edison Company to its generation, transmission and distribution system is a distinct contribution toward increased reliability and continuity of service in the electrical industry. It places the responsibility for maintaining service through a given group of lines and stations directly in the hands of the man who is in a position to do the necessary switching without dependence upon communication.

There are a number of such points of control throughout the system, known as switching centers, from which all detailed dispatching is transacted. These switching centers are the result of developments which began five years ago, when the first switching centers were established in outlying districts to dispatch the local transmission and distribution system. The step was taken to relieve the central dispatching organization of certain detail switching which could be transacted more effectively from local stations, due to better communication facilities and personal contact with the local transmission and distribution organizations. Because of the phenomenal growth and development in southern and central California, and the rigid service requirements, further decentralization of dispatching became necessary, resulting in the present organization of 24 switching centers, from which all the detail dispatching is transacted. A group of supervisory dispatchers are responsible for the co-ordination and supervision of all dispatching operation. At all times they are in a position to take over any or all operations during an extreme emergency which is beyond the jurisdiction of any one switching center.

To carry out the necessary switching directly from the switching centers in a systematic and safe manner required a great deal of preparatory work in grouping of lines and stations and in sectionalizing the system. The accompanying schematic diagram of the 220- and 66-kv. transmission systems shows the location of the various switching centers with relation to the 220-kv. "backbone" of the system, which is continuous from Big Creek to Long Beach, a distance of approximately 275 miles. Also the sectionalizing points on the 66-kv. system are shown to indicate how they create six separate 66-kv. groups, each with one or more 66-kv. switching center and each with lines and stations grouped into a radial system instead of the original loop system.

Dispatching of routine operations in each group, such as switching of lines and equipment, issuing of working clearances, adjustment of load distribution and requests for equipment out of service, are carried out in the usual manner by the switching center in the group. These operations can be dispatched with unusual promptness due to the fact that the switching center is the source for practically all of the stations in the group. Thus all operations at the source are handled directly and the stations at the receiving end have a direct line of communication with the switching center. The patrolmen and division superintendents as a rule have their headquarters at the major switching centers, thereby establishing a close personal contact within the organization, all of which results in better co-ordination and efficiency throughout.

Dispatching operations in each switching center are carried out by the regular substation organization as an essential part of the operation of that particular station. Experience has shown that this additional work and responsibility does not increase the personnel in the switching centers, but does require a more highly developed and efficient operating organization.

Local circuit and switching diagram boards are mounted in each of the 24 switching centers. These show all the details of lines, switches and equipment involved in the particular group of stations, and also show sufficient detail of adjacent switching centers, points of overlapping jurisdiction and possible sources of power to give the operator-dispatcher a thoroughly clear picture of his operating set-up.

The decentralized method of dispatching is long past the experimental stage and during the past five years has demonstrated conclusively its effectiveness and advantages over centralized dispatching. Some of the major advantages are:

1. Provision for the most direct means of switching lines, issuing clearances and carrying out routine and emergency dispatching operations over a territory of 55,000 square miles.

2. Makes possible the maintenance of service throughout the system in the event of loss of communication. The necessary switching operations are automatically carried out by the switching centers.

3. Elimination of all delay in restoring service following an interruption. All necessary operations are carried out directly from the switching centers in the length of time required for the operator-dispatcher to make his observations and carry out the necessary switching.

4. Makes possible the simplifying of the company's communication system, removing loading from the lines and thereby giving better service on existing lines.

Communication

The private communication system* of the company is extensive on account of the character of the territory and the impracticability of utilizing commercial communication facilities in many parts thereof. The total area served is 55,000 square miles, in which there are located 1,400 telephones. The system includes three 100 unit private automatic exchanges, a modern three-position toll board and three outlying exchange centers. There are 6,000 circuit-miles of open-circuit toll lines and 400 circuit-miles of cable. By proper attention to co-ordination, maintenance of good balance and protection these communication lines are highly satisfactory in spite of their severe exposure to inductive interference because of their proximity to high-voltage lines.

On the 220,000-volt backbone of the system every possible step must be taken to preserve continuity of communication. Owing to the mountainous nature of the country which the lines traverse, there is always the possibility of the telephone lines being damaged by sleet storms, brush fires, etc. Therefore it was considered advisable to install a carrier-current telephone system. This extends from the Big Creek No. 3 hydro plant by way of the 220,000-volt Big Creek and Vincent transmission lines to Gould switching station, near Los Angeles, with a wire extension to the supervisory dispatcher's office. An intermediate carrier-current telephone station is provided at Magunden switching center.

Commercial telephones are also located in many substations and in all district offices and stores so that in

*Based on "The Communication System of the Southern California Edison Company, Ltd.," R. B. Ashbrook and F. B. Doolittle, presented at the Pacific Coast convention of the A.I.E.E., September, 1930.

effect an independent duplicate telephone system is available for emergency use by long-distance calls to many strategic points on the system.

With decentralized dispatching the operation of the system is less dependent upon communication than was the case during the early days when all operations were directed from a central dispatching center. Nevertheless, the importance of good communication cannot be overestimated. Several years' experience with a constantly improving communication system has demonstrated that good telephone service promotes not only efficient operation but also close co-operation between departments, thus making it possible to render the highest type of service to the consumer.

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Promotional Rates Quicken Commercial Pulse

Graphic demonstration of the stimulating effect of promotional rates on residential energy consumption over periods of years was given at the recent N.E.L.A. convention by Samuel Ferguson, president Hartford Electric Light Company. On the Hartford system the straight-line meter rate prevailed from 1916 through 1921, the usage remaining practically constant except for a slight decrease during the war. Following the establishment of a promotional rate in 1922, the energy consumption per residence customer steadily gained until in nine years it has more than doubled, taking the 1916 figure as 100 per cent.

That these gains were not mere coincidences is shown in the gains of two other companies, "B" and "C," which established promotional rates in 1925 and 1927 respectively. The rise in usage began soon after the promotional rates went into effect, and gained more rapidly in the two latter cases because the new rates when adopted were more truly promotional in form than when the first company established its own promotional rates, and because in the case of the maximum increase there was no gas service in the territory.

Executives must be convinced of the value of low-rate domestic business, Mr. Ferguson pointed out, notwithstanding the fact that the promotional type of rate has been largely accepted in form by the industry. The permissible lowness of the energy component is not fully realized today, but it must be appreciated if the industry is to take advantage of its opportunities. Fig. 2 shows a 24-hour load curve of 25 moderate-sized single houses on the Hartford system served by a 15-kw. transformer. The curve was taken for the day of maximum peak covering the months of December and April. The hours of maximum load were midnight and noon, and the maximum was 14 kw. Among these 25 customers were utilized twenty refrigerators, twenty oil burners, ten ranges and six water heaters. These, together with lighting and miscellaneous equipment, brought the total connected load to 125 kw. The water-heating service was supplied by large clock-controlled storage tanks. The water-heating load is shown in the lower part of the chart. The clocks switch on the load at 11 p.m. and the thermostats cut it off from 2 a.m. to 7 a.m. according to requirements. In one house the day make-up unit came on for two half-hour periods.

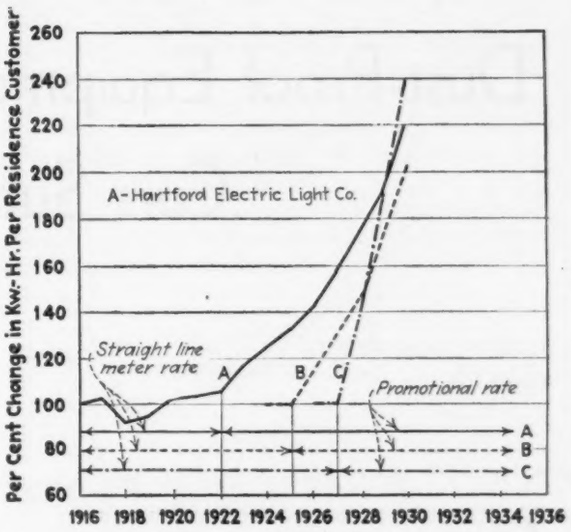


Fig. 1—Rapid increase in household usage follows adoption of promotional rates

The average rate paid by the whole group is 3.7 cents per kilowatt-hour for 1,800 kw.-hr. per annum, or an average of $5.55 per customer per month. The revenue for the group as a whole is $120 per kilowatt-year. In April the bills of the individual customers ranged from $2.20 for 23 kw.-hr. to $13.50 for 522 kw.-hr. For the more common intermediate use of about 200 kw.-hr. per month the bill is about $8, or 4 cents per kilowatt-hour. At present the excess revenue from the liberal user is needed to compensate for the losses incurred in serving a great number of small customers below cost, but as the relative percentage of the latter decreases, there will be room for still lower prices for load factors of this nature in the domestic field. "If we are going to do the job and give complete home service, we must do it in a big way," said Mr. Ferguson. "It will take forever if we plod along selling a range here and a water heater there, while our customers are getting restless and talking about what they could enjoy at Ontario prices, when all the time it is within our power to electrify their homes at so reasonable an operating cost as completely to meet their requirements."

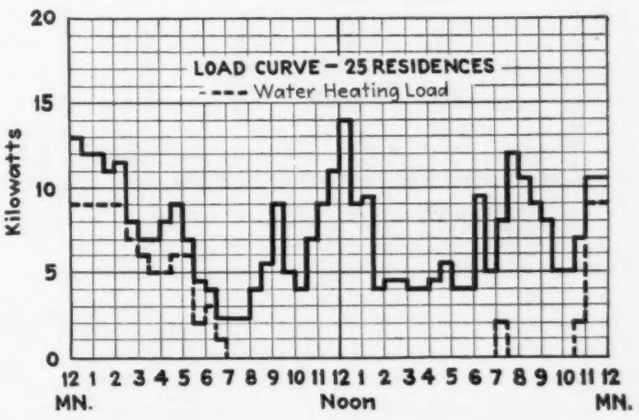


Fig. 2—Twenty-five homes with heavy-duty service partially adopted earned a rate of 3.7 cents per kilowatt-hour

Diversity is improved through use of controlled off-peak water heating.

Dust-Proof Equipment Cuts Substation Costs 25 per Cent

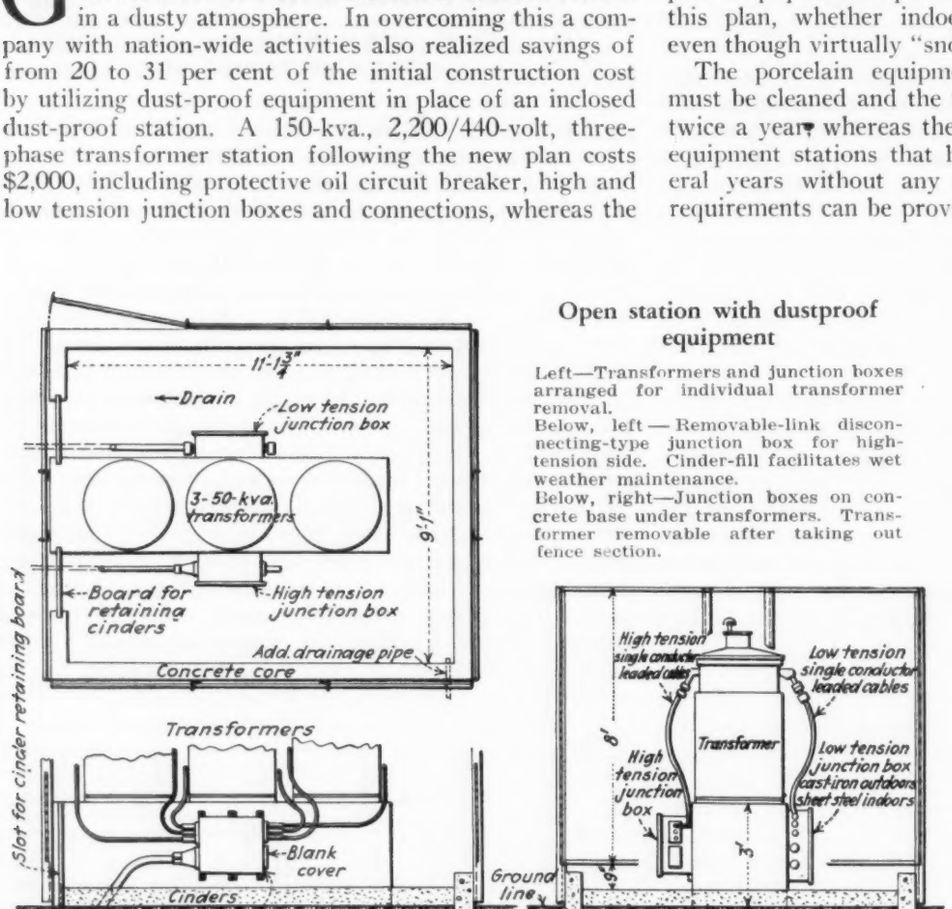
By JOSEPH T. WAUGH
Allentown, Pa.

GRITTY dust accounts for 50 per cent of the maintenance cost for transformer stations located in a dusty atmosphere. In overcoming this a company with nation-wide activities also realized savings of from 20 to 31 per cent of the initial construction cost by utilizing dust-proof equipment in place of an inclosed dust-proof station. A 150-kva., 2,200/440-volt, three-phase transformer station following the new plan costs $2,000, including protective oil circuit breaker, high and low tension junction boxes and connections, whereas the old style design, involving transformers in a dust-proof room, costs $2,900 for the same plant service. Moreover the dust-proof room itself takes up valuable manufacturing space or requires outside construction, while the dust-proof equipment requires a minimum ground area, and this plan, whether indoors or out, permits operation even though virtually "snowed under" with dust.

The porcelain equipment within the inclosed room must be cleaned and the transformer oil filtered at least twice a year, whereas there are a number of dust-proof equipment stations that have successfully operated several years without any attention whatsoever. Future requirements can be provided for by originally installing maximum size single-conductor cables and the transformer substitution made as required.

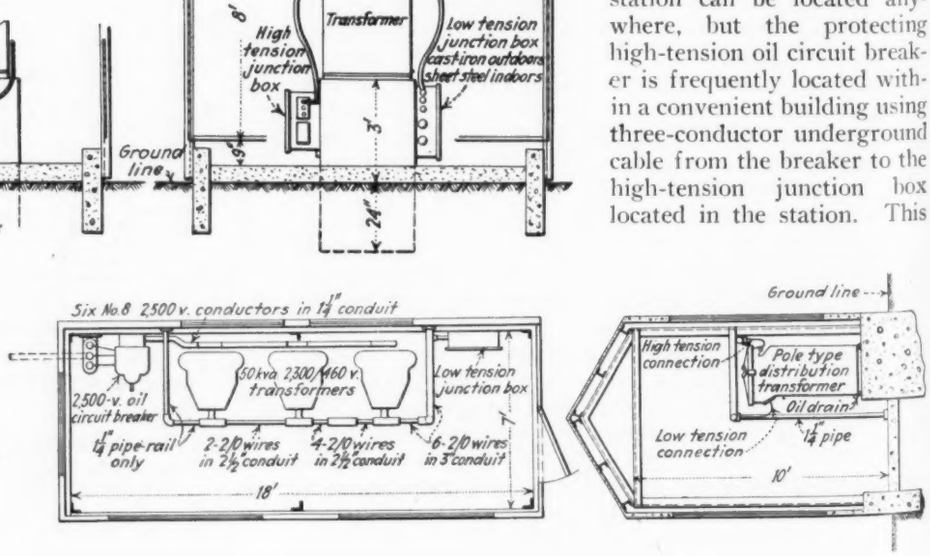
Variations of the dust-proof inclosed station rest in the manner of introducing the high-tension feeders and of installing a safety switch or low-tension oil circuit breaker on each of the outgoing low-tension feeders. For comparison a sheet steel junction box is used for the indoor station and a similar, but cast-iron, box for the outdoor station.

The dust-proof equipment station can be located anywhere, but the protecting high-tension oil circuit breaker is frequently located within a convenient building using three-conductor underground cable from the breaker to the high-tension junction box located in the station. This



Open station with dustproof equipment

Left—Transformers and junction boxes arranged for individual transformer removal.
Below, left — Removable-link disconnecting-type junction box for high-tension side. Cinder-fill facilitates wet weather maintenance.
Below, right—Junction boxes on concrete base under transformers. Transformer removable after taking out fence section.



Transformer housed in dustproof shed

connection of variable length is omitted in the cost data, since the comparison is based on similarly located stations.

If it is convenient to locate the station against an inside or outside building wall, then single-conductor high-tension transformer leads are run directly from the oil circuit breaker, the rear fence is eliminated and both sides are shortened, thus increasing the percentage saving for the dust-proof equipment over the other type. An isolated station requires a weather-proof high-tension oil circuit breaker located on the high side in front of the left-hand transformer, permitting the removal of the transformer through the side fence.

Standard distribution transformers are available with subway covers and cable entrances consisting of brass tubing with a right and left hand threaded coupling. This coupling permits screwing a cable connector into the lower end; belling the lead sheath of the cable makes a watertight and dust-proof removable entrance. The cable, with sheath removed, is then fed through the tubing and connection made to the terminal board. Thus the porcelain insulators, habitual dust collectors, are eliminated. If the box is located horizontally the cross-over of one transformer lead is eliminated, but the width of the station is then increased by several feet, although the cost is almost the same in either case.

The investment in heavy cables and the hysteresis and eddy current losses are the limiting factors of the dust-proof equipment station, since brass low-tension junction boxes are required with transformers above 200 kva. individual rating, and this considerably reduces the savings encountered. Therefore, it is economical to use this design for all stations in dusty locations from 75 to 600 kva. capacity. Comparative costs for 150-kva. and 600-kva. dust-proof equipment and dust-proof stations are shown in Tables I and II, respectively.

Table I—Comparative Costs for 150-Kva. Industrial Substation

Dust-Proof Station vs. Dust-Proof Equipment.
60 Cycles, 2,200/460 Volts

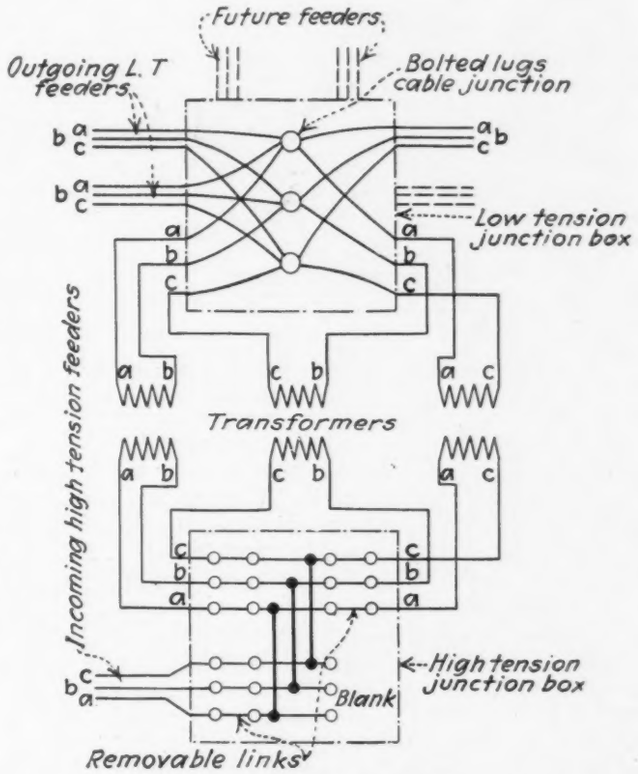
Dust-Proof Station	Costs	Dust-Proof-Equipment	Costs
3 50-kva. pole-type distribution transformers	$1,033.00	3 50-kva. subway-type transformers with cable connectors	$1,164.00
1 High-tension oil circuit breaker with conduit box.	90.00	1 High-tension oil circuit breaker	75.00
1 Low-tension junction box, complete	25.00	1 Junction box, high tension	244.00
75 ft. 1/c No. 8 2,500-volt rubber-insulated cable	3.00	1 Low-tension junction box, complete	35.00
100 ft. 1/c No. 2/0 600-volt rubber-insulated cable	8.00	60 ft. 1/c No. 8 2,500-volt varnished-cambric leaded cable	4.00
10 ft. 3-in. conduit	6.00	60 ft. 1/c No. 2 600-volt varnished-cambric leaded cable	6.00
5 ft. 2½-in. conduit	3.00	6 Cable connectors for 1/c No. 2	5.00
35 ft. 1¼-in. conduit	6.00	Grounding equipment	25.00
Various condulets, covers and pipe fittings	40.00	Electrical labor	75.00
Grounding equipment	45.00	Excavation	10.00
Lighting complete	85.00	Concrete foundation and curb	140.00
Labor except structure	150.00	Cinders	5.00
Excavation	20.00	Fence complete	82.00
Foundations	220.00		$1,870.00
Superstructure	890.00	Painting and miscellaneous.	130.00
	$2,624.00	Total	$2,000.00
Painting and miscellaneous.	276.00		
Total cost	$2,900.00		

Saving in using dust-proof equipment $900.00
Saving, per cent 31

Table II—Comparative Costs for 600-KVA. Industrial Substation

Dust-Proof Station	Costs	Dust-Proof Equipment	Costs
3 200-kva. pole-type distribution transformers	$2,269.00	3 200-kva. subway-type transformers with cable connectors	$2,699.00
1 High-tension oil circuit breaker with conduit box	90.00	1 High-tension oil circuit breaker	75.00
1 Low-tension junction box.	30.00	1 High-tension junction box	244.00
75 ft. 1/c–1/0 2,500-volt rubber-insulated cable	7.00	1 Low-tension junction box.	40.00
100 ft. 1/c, 750,000-circ. mil., 600-volt cable	31.00	60 ft. 1/c–1/0, 2,500-volt lead-covered, varnished cambric cable	11.00
40 ft. 3½-in. conduit	30.00	60 ft. 1/c, 600,000-circ. mil., 600-volt cable	33.00
15 ft. 2½-in. conduit	8.00	6 cable connectors for 1/c, 600,000-circ.mil. cable	10.00
40 ft. 1¼-in. pipe railing	7.00	Grounding equipment	25.00
Various condulets, covers and pipe fittings	80.00	Electrical labor	85.00
Grounding equipment	50.00	Excavation	10.00
Lighting complete	85.00	Concrete foundation and curb	140.00
Labor except structure	200.00	Cinders	5.00
Excavation	20.00	Fence complete	82.00
Foundation	240.00		$3,459.00
Superstructure	1,040.00	Painting and miscellaneous.	241.00
	$4,187.00	Total	$3,700.00
Painting and miscellaneous.	413.00		
Total cost	$4,600.00		

Saving in using dust-proof equipment $900.00
Saving, per cent 20



Wiring for dustproof equipment

Only one lead crossing involved between transformers and high-tension junction box

READERS' FORUM

The Ultraviolet Situation

To the Editor of the ELECTRICAL WORLD:

The editorial on the ultraviolet situation in the ELECTRICAL WORLD, June 27 issue, seemed to me to imply that the claim of benefits to be derived from ultraviolet were either exaggerated or unfounded. I do not believe you intended it so, although you are correct in your statement that "It is well to place every possible curative means in the hands of biologists and men of medicine to experiment with."

That is exactly what is being done in the case of ultraviolet. The experiments are being made on chickens and mice, the method which has been so productive in other fields of medicine. The fact that ultraviolet has already proved beneficial in experiments on children suffering from rickets represents commendable progress.

Each new development of light was met with a reactionary clamor. But no engineer would say that our present system of lighting is perfect. If the natural properties of sunlight can be simulated more nearly in the home, it would seem that we are showing progress.

I was present when a client requested a lighting engineer to install ultraviolet in the nursery of his home. The engineer's answer was that the prospect should go to his physician and get a prescription stating the amount of ultraviolet by weight that it was safe for his children to have.

I believe that responsible companies experimenting with ultraviolet are taking due precautions to get all possible co-operation from qualified biologists.

As a rule, their statements have been conservative, and I believe that they deserve the sympathetic and unselfish encouragement of the entire electrical industry in their efforts to provide better lighting.

JOSEPH HENRY O'NEIL.

Claude Neon Lights, Inc.,
New York City.

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Engineer's License, Plumber's License and Dog's License

To the Editor of the ELECTRICAL WORLD:

I was very much amused by your editorial in today's issue on engineers' licenses and the exaggerated importance that you attribute to them. I have had one since they were started in the state of New York. I believe that I paid $25 for it; since then I have been paying $1 a year. I was even induced to acquire a seal, which I supposed would put me on a par with those great men who are known as notaries public or commissioners of deeds. I have been actually engaged in engineering through all these years and I have yet to find out what to do with that license. I doubt very much if it raises the standard of an engineer. On the contrary, it lowers it; it puts him on a par with the possessor of a plumber's license or a dog's license.

If a man puts P.E. after his name it is known at once that he didn't graduate and has no engineering degree. Will the editor kindly tell me if he is the proud possessor of a license and what he does with it?

New York. M. M. SAMUELS.

If the editor were engaged in engineering practice he would have a license, he would deplore the present status of registration, he would conspire to elevate its public significance and professional import and hope by this route to lift engineering practice out of trade levels into professional respect.—EDITOR.

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Simulated Sunlight Is Something Else Again

To the Editor of the ELECTRICAL WORLD:

I am very much interested in the editorial on page 1210 of the June 27 issue of the ELECTRICAL WORLD. We feel that a great deal of the confusion, misrepresentation, overemphasis and fear in this whole subject of ultraviolet irradiation comes from the stressing of the ultraviolet feature rather than the attempt to reproduce sunlight.

The stressing of the ultraviolet portion of sunlight is comparable to the stressing of the caffeine content of coffee. Personally, I want my coffee with the caffeine in it, but I am not so sure that I care to take caffeine in allopathic doses. Somewhat the same situation exists with regard to sunlight. Good sunlight contains its proper amounts and qualities of ultraviolet light, but to stress those qualities and supply some wavelengths not found in sunlight seems to me to be placing the emphasis in the wrong place.

In the general promotion of health, it is not quackery nor commercialism to emphasize the value of sunshine as one of the most important factors. Even though there has not yet been sufficient investigation of the value to health from the visible and heating rays of sunlight, sufficient investigations have been conducted to indicate that these rays also produce certain biological stimulations which are beneficial to health.

Unfortunately, the medical profession as a profession has neglected the use of sunlight for a great many years, possibly due to the ease with which quacks can take it up and use it. Recently, biologists have begun to make a more intensive study, and I believe that it will be from them that we get the correct answers as to the effects of sunlight with or without ultraviolet rays shorter than 3,100 Angstrom units and perhaps due regard will be given to those rays shorter than 2,900 Angstrom units which are not found in sunlight after it filters through the atmosphere.

In the meantime, it is the belief of many prominent physicians that manufacturers should spend their efforts to reproduce the whole of sunlight rather than specific portions of it, and it is in this direction that we have spent much of our energies in the National Carbon Company, although we have also produced carbons capable of generating unusually large amounts of the shorter wave ultraviolet radiation where such radiation may be useful particularly in photochemistry for industrial processes.

E. A. WILLIFORD,
Manager Carbon Sales Division.

National Carbon Company,
Cleveland, Ohio.

Men of the Industry

J. J. Molyneaux New Vice-President in Minneapolis

JOHN J. MOLYNEAUX, who was recently elected vice-president and treasurer of the Northern States Power Company, has taken an active part in the development of utility accounting and has always been deeply interested in accounting and financial matters of the Byllesby organization. On January 1, 1917, he entered the employ of the Byllesby organization as supervising

auditor of the Oklahoma Gas & Electric Company and other Southern properties. Nine months later he was transferred to the Northern States Power Company of Minneapolis as treasurer and occupied that position until his recent promotion.

Mr. Molyneaux was born in Chicago and received his A.B. degree at the Christian Brothers College of St. Louis, Mo. His early business experience was obtained in the banking field.

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DR. M. LUCKIESH and FRANK K. Moss of the lighting research laboratory of the General Electric Company in Cleveland received the gold medal of the Distinguished Service Foundation of Optometry.

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LUKE ELLIS, formerly connected, with the Pennsylvania Water & Power Company, and more recently associated with the Public Service Commission of Maryland, has been appointed associate engineer in the Department of Public Works, Baltimore. Mr. Ellis has been assistant chief engineer of the Public Service Commission for a number of years and for about a two-year period acted as chief engineer. In his new position he will have charge of public service corporation work in the department.

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D. H. HANNON, manager of the Georgia Power Company at Reynolds, has been transferred to Tifton.

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W. F. RABER, who has been vice-president and general manager of the San Diego Consolidated Gas & Electric Company since 1924, was elected president of that utility at a meeting of the board of directors.

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O. T. JOHNSON, JR., member of the Los Angeles, Calif., Board of Water and Power Commissioners since May, 1930, has resigned. The appointment of Mr. Johnson to the commission immediately followed the resignation from the board of Harlan G. Palmer, Hollywood newspaper publisher. At the time of his appointment Mr. Johnson was a member of the board of directors of the Metropolitan Water District of Southern California. He resigned from the district board to accept the appointment of Mayor Porter to the municipal water and power board.

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EDWARD J. MEHREN, vice-president of the McGraw-Hill Publishing Company, Inc., has been elected president of the Portland Cement Association and will devote his whole time to the position. Mr. Mehren's career in engineering and publishing extends over a period of 24 years. Born in Chicago, after his graduation from the University of Illinois in 1906, he entered the employ of the Chicago, Milwaukee & Puget Sound Railway. In 1907 he became associate editor of the *Engineering Record*, which in 1918 merged with *Engineering News* to form *Engineering News-Record*, and Mr. Mehren was named editor. At the same time he was elected vice-president of the McGraw-Hill Publishing Company and in 1921 he also became chairman of the editorial board. In 1923 Mr. Mehren was promoted from the editorship of *Engineering News-Record* to the position of editorial director of the McGraw-Hill company. In 1929, on the absorption by the McGraw-Hill company of the publications of the A. W. Shaw Company of Chicago, Mr. Mehren was transferred to Chicago as resident vice-president in charge of the magazines published in that city.

P. M. Parry Heads Northwest Association

P. M. PARRY, who was elected president of the Northwest Electric Light and Power Association, as announced in the news department of this issue of the ELECTRICAL WORLD, has been vice-president and commercial manager of the Utah Power & Light Company for the past two years. He has been one of the indefatigable workers for the best interest of the electrical industry in

that section of the country, where he was born and educated.

Mr. Parry was born in Ogden, Utah, and received his early education in the schools of that city. He entered the public utility field in 1904 when he became an employee of the Utah Light & Railway Company in his native city. His work even that far back was along the lines of accounting. In 1911 he was named treasurer of the Merchants Light & Power Company and remained in that position until that property was included in the consolidation of a number of companies to form the Utah Power & Light Company. He then was appointed manager of the Ogden division, and after occupying that office for seven years was promoted to the commercial managership. He assumed the duties of vice-president in the summer of 1929.

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J. D. Ross, dismissed as superintendent of Seattle's municipal lighting department on March 9 by Mayor Frank Edwards and returned to that position on July 14, following the recall of Mayor

Edwards, has been named chairman of the Board of Public Works by Robert H. Harlin, former Councilman, named Mayor by the City Council to complete Edwards' term.

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E. D. MADDEN has been appointed service manager of the Delco Products Corporation, Dayton, Ohio. Mr. Madden has been identified with that corporation for the past seven years.

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PAUL TYSINGER, for several years connected with the sales department of the Winston-Salem branch of the Southern Public Utilities Company, has become a member of the lighting service department.

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THOMAS S. BURNS, formerly hydroelectric engineer with the Power Corporation of New York, has been appointed senior engineer in the United States service with headquarters at Huntington, W. Va. In his new position he will have charge of navigation, water power and flood studies. Mr. Burns is a graduate of the University of Wisconsin.

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H. E. M. KENSIT, who has spent fifteen years in the Dominion Civil Service, is retiring August 1 to enter private practice. After a number of years on investigating work in Canada and the United States and on construction work in Canada for Messrs. Smith, Kerry & Chace of Toronto, Mr. Kensit was appointed to the then water-power branch of the Department of the Interior to investigate and report upon the financial and engineering aspects of special water and fuel power problems. He made a detailed investigation of the South Saskatchewan water supply diversion project and an exhaustive report on the interests dependent on Winnipeg River power for evidence to put before the International Joint Commission in the Lake of the Woods reference. Following discharge from military service, he represented the Dominion water-power branch on the water-power resources committee of the British Government and on the water-power committee of the conjoint Board of Scientific Societies in London, England. On returning to Canada he made special studies of the power situation in Winnipeg and in Calgary and took an active part in the preparation of the Dominion water-power regulations. More recently he has made studies of the power demand and duration of water-power resources in the St. Lawrence and Great Lakes Basin and other large areas. Mr. Kensit is a member of the Engineering Institute of Canada, of the Association of Professional Engineers of Ontario and of the American Institute of Electrical Engineers.

OBITUARY

John N. Carlisle

JOHN N. CARLISLE, president of the Northern New York Utilities, Inc., whose death was announced in the July 25 issue of the ELECTRICAL WORLD, was an officer of many other Niagara Hudson companies and a distinguished leader in state affairs. He was a brother of Floyd L. Carlisle, chairman of the board of Niagara Hudson Power Corporation, and has been associated with him from the first in the organization of utility systems in northern New York. Mr. Carlisle achieved distinctive leadership in business life as well as in public service. He was born at Preble, Cortland County, in 1866, removing to

Watertown with his parents when a boy. He chose a legal career and was admitted to the bar in 1889, eventually forming a partnership with his younger brother, Floyd.

He early began his career in public life as city attorney in 1891-92 and as a member of the Board of Education from 1901 to 1904. His career in state affairs covered a period of 40 years or more. As state Highway Commissioner from 1913 to 1915 he was responsible for the complete reorganization of that department, completed system of roads throughout the northern section of the state and brought about large economies. In 1919 he was selected to investigate the city affairs of Albany.

When Floyd L. Carlisle and his associates organized the Northern New York Utilities, Inc., in 1920, John N. Carlisle was selected to head the corporation, and he continued as active head when that important group became a member of the Niagara Hudson System. His other utility affiliations included membership in the Black River regulating board, president of the Power Corporation of New York and director of the Mohawk Hudson and Northeastern Power Corporations. He was also a director of the St. Regis Paper Company and the Northern New York Trust Company. Reforestation and water storage were two of his major interests, and he furthered them as vice-president of the New York State Conservation Association and president of the Empire State Forest Products Association.

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ARTHUR L. CHURCH, mechanical engineer, who was secretary of the Baldwin Locomotive Works, died recently, of heart disease, at the Pennsylvania Hospital, Philadelphia, in his seventy-third year. Mr. Church had been affiliated with the Baldwin company since 1886. He was a trustee of the Moore School of Electrical Engineering.

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ROBERT N. PARRETT, 81 years old, well known in public utility circles in Indiana, died recently at his home at Princeton, Ind. A native of Evansville, in 1890 he purchased an interest in the Princeton Light & Power Company, then a small enterprise in which L. J. Rothschild and William R. Skelton were the operators. He moved to Princeton the next year and resided there up to his death. He immediately took an active interest in the affairs of the light company and in 1893 the company was incorporated with a capital stock of $100,000. He continued as the active head of this company until it was sold to the Public Service Company of Indiana some few years ago. He was a banker and was interested in many other enterprises in Princeton.

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WILLIS EDWARD HALL, retired consulting engineer, died July 25 in Philadelphia, his native city. Mr. Hall was 71 years of age. A pioneer in the field of steam railroad electrification and an inventor of some note, he had to his credit the invention of the Hall automatic control for return system of steam heating, now in practically universal use, and other devices and methods relating to mechanical engineering. After leaving the University of Pennsylvania he passed a year in the designing department of the Baldwin Locomotive Works and then went to the shops of the Pennsylvania Railroad in Altoona, and later to the Niles Tool Works. In 1902 Mr. Hall established a consulting practice in New York, but retired after ten years. He was a member of the American Society of Mechanical Engineers and a life member of the Historical Society of Pennsylvania.

Financial and Statistical News

DULLNESS characterized the early days of the market this week, with the speculative element refraining from activity while awaiting action on United States Steel dividend. Trading was confined to small volume and price movements all along the line were decidedly unimportant.

——ALTHOUGH THE PRICES OF UTILITIES' STOCKS DECLINED MODERATELY, as a group they showed a somewhat firmer tone than the industrials, after the announcement of the reduction of the U. S. Steel dividend. Industrials broke sharply.

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Dividend Announcements

DIRECTORS OF THE Brazilian Traction, Light & Power Company, Ltd., have declared a quarterly cash dividend of 25 cents per share on the issued ordinary shares of no-par value, payable September 1 to holders of record July 31. Previously the company made quarterly distributions of 2 per cent each on this issue.

Common-stock dividend was resumed by New Orleans Public Service, Inc., when the directors recently declared a dividend of 56¼ cents per share on the common stock, no-par value, payable July 1 to holders of record June 16. The company had paid regular dividends of this amount each quarter from 1925 to and including July 1, 1929.

Directors of the Old Colony Light & Power Associates have declared a quarterly dividend of 60 cents per share on the common stock, no-par value, and the regular quarterly dividend of $1.50 per share on the preferred stock, both payable July 2 to holders of record June 18. Previously the company made regular quarterly distributions of 70 cents per share on the common stock.

Directors of the Eastern States Power Corporation have voted to omit the quarterly dividend which ordinarily would have become payable about August 1 on the class B common stock of no-par value. From February, 1930, to and including May, 1931, a quarterly distribution of 25 cents per share was made on this issue.

Directors of the Peoples Light & Power Corporation have voted to defer the regular quarterly dividends due August 1 on the $7, $6.50 and $6 cumulative preferred stocks, no-par value. The last quarterly payment on these issues of stock was made on May 1, 1931.

Barcelona Traction, Light & Power Company, Ltd., announces that in view of the unsettled conditions in Spain and the depreciation of the peseta, action on the common dividend will be deferred until next December. The payment, which was due to be declared in June, has been postponed.

New England Merger Is Completed

MERGER OF ACTIVITIES of Charles H. Tenney & Company in the public utility field with those of the New England Power Association, which was announced June 20, has now been completed, according to President Frank D. Comerford of the association. A large percentage of the voting trust shareholders of the North Boston Lighting Properties have exchanged their certificates for shares of Massachusetts Power & Light Associates. In order to enable the remaining certificate holders to take advantage of the exchange offer the time has been extended to August 22. An exchange offer will be made to holders of undeposited common and preferred shares.

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Historical Cost Fair Base If Above Reproduction Cost

By PAGE GOLSAN

Vice-President Ford, Bacon & Davis, Inc.

PRESENT prices of construction materials are causing some concern in presenting rate cases. Copper at 8 cents is quite different from the prewar 16-cent average and recent prices above 20 cents.

During the period when reproduction new valuations were consistently above historical cost a more or less definite procedure was worked out among courts, commissions and utilities. Should prices continue to decline, however, the presentation of cases and the subject of valuations for rate making again must go back to fundamentals.

The fundamental viewpoint is the type of the particular case. There are two:

(a) The commission case, in which the state exercises its police power to fix, in equity, a fair rate.

(b) The court case, in which the constitutional power is invoked to correct errors in fixing rates so low as to confiscate property.

The conditions that govern these two procedures are different. One is a matter of equity, the other is a matter of law. The commission's duty is to fix a reasonable rate. The court's duty is to pass upon the reasonableness upon appeal.

Commission procedure is to determine a fair return upon a fair rate base. Courts say this return shall not be fixed at less than interest on a fair value. The formulas are:

(Commission) Return per cent × Rate Base = Fair Return.
(Court) Interest per cent × Fair Value = Minimum Fair Return.

The question of a reasonable commission case rate base clearly is, and has always been, a matter of fairness and equity. It cannot follow ironclad rules. Many factors must be considered and the fair return so established that new capital will flow into the business to meet the constant demands for more service. When reproduction valuations were higher than historical cost, reproduction became the important consideration in fixing the rate base. Not only court decisions but economic conditions required the use of reproduction as a guide because it totaled up to figures that were comparable in amount to the rate base on other equitable bases.

Reproduction cost lower

Now we are faced with new conditions. Reproduction may eventually be lower than historical cost. Whenever

that is the case the fair and equitable rate base will take the view that historical cost is the lower limit. This is not inconsistent with the former reproduction view. When questions of equity arise there are bound to be limits to any rule beyond which results are not equitable. The upper limit to rates are many indeed, not only in the rate proceeding itself, but in the economic ability to produce proper revenue.

Certainly the owners of a utility are entitled to earn at least a fair return upon investment made in good faith.

Since historical cost has always been an important factor in the rate base and may now take on more importance, it will be desirable that rate case valuations be submitted in both historical and reproduction cost form.

A company's books of account, except in cases where the whole plant is new, are not sufficiently reliable to provide prime basis of historical cost. It is not possible to keep capital accounts sufficiently accurate. Constant changes, betterments and retirements may lead to considerable error. For example, a betterment program may change only part of certain plant, as in the increasing of the size of feeders where other lines remain unchanged, or partial change from overhead to underground. Few companies ten years ago reflected such changes properly in their books.

The historical valuation requires a high degree of skill in pricing. Unit costs must be the "weighted average" derived from the records by a detailed analysis of invoices, store requisitions, payrolls, labor records and other data. Direct averages or price trends will not serve. Prices of materials have varied so widely that the quantities installed at each price must be carefully considered.

Once the historical cost valuation has been completed it is relatively easy to bring it up to date from time to time with modern accounting practice.

It would appear, therefore, that the presentation of valuations for rate cases should continue as formerly, but it should be definitely recognized that where reproduction valuations are less than historical cost valuations, the rate base should not be less than the historical cost.

The proponents of reproduction need not fear that they will appear inconsistent, nor will the proponents of historical cost valuations have occasion to feel that they have necessarily won their argument. After all, "reproduction" and "historical" are but measuring sticks defining physical properties, whereas going concern and other intangibles are of great importance in arriving at a fair rate base.

Martin Insull Sees Evidence of Business Upturn

POINTING out that emphasis given the threat of Germany's financial collapse has completely overshadowed sharply defined improvement in the domestic industrial situation, Martin J. Insull, president of the Middle West Utilities Company, cited substantial improvement in the nation's kilowatt-hour consumption as definite evidence of business upturn.

"For the week ended July 18, 23 of the 28 large electric systems of the country report percentage increases over their output figures for the first 28 weeks of the year," said Mr. Insull. "These increases make the week's showing 2 per cent better than the year's showing to date. The trend indicated is clearly upward, and of necessity originates in the acceleration of industrial consumption all over the country.

"While I wish in no way to discount the gravity of the European situation, I believe the healthiness of the basic index of our situation, which is electric power output, is cause for firming up the courage and optimism of all American business."

Mr. Insull's own company, Middle West Utilities, shows an increase of 8.4 per cent for the week ended July 18, as against an increase of 3.9 per cent for the year to date.

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Recent Listings

NEW YORK STOCK EXCHANGE has authorized the listing of first and refunding mortgage gold bonds of the Central Illinois Electric & Gas Company, to the amount of $15,000,000.

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Baltimore Stock Exchange has authorized the listing of first mortgage sinking fund gold bonds of the Safe Harbor Water Power Corporation to the amount of $21,000,000.

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NEW SECURITY ISSUES OF ELECTRIC SERVICE COMPANIES IN JULY

Name of Company	Amount of Issue (Par Value)	Period (Years)	Class	Purpose	Interest Rate	Price	Per Cent Yield
Rochester Gas & Electric Corp.	$10,000,000	1	Gold notes	To retire bonds and for other corporate purposes	3	100	3.00
Midland United Co.	11,000,000	¼–1	Serial gold notes	To reimburse for acquisitions, construction, and for other general corporate purposes	2–4½	...	2.25 to 4.75
Wisconsin Valley Electric Co.	4,000,000	1	Gold notes	To retire current indebtedness and to reimburse company for expenditures on additions and extensions	4½	99½	5.00
Wisconsin Public Service Corp.	2,500,000	1	Gold notes	To retire current indebtedness, to reimburse for expenditures on additions and extensions	4	99½	4.50
Central Maine Power Co.	2,000,000	26	First and general mortgage gold bonds, series E	To reimburse for retirement of bonds and for other corporate purposes	4½	100	4.50
Arkansas Power & Light Co.	2,000,000	25	First and refunding mortgage gold bonds	To reimburse for property additions and acquisitions, and for other corporate purposes	5	100	5.00
Pacific Power & Light Co.	3,500,000	24	First mortgage and prior lien gold bonds	To reimburse for advances to subsidiary, for construction and for other corporate purposes	5	98½	5.11
Gary Electric & Gas Co.	8,000,000	3	First lien collateral gold bonds, series A	To reimburse in part for acquisition of control of other utility	5	98	5.75
Commonwealth Edison Co.	20,000,000	1	Gold notes	Refunding and to raise funds for additions and extensions	3½	99.88	3.62
Public Service Co. of Northern Illinois	15,000,000	1	Gold notes	To discharge all bank indebtedness and to provide funds for additions	4	100	4.00
Delaware Power & Light Co.	6,000,000	40	First mortgage gold bonds	To retire bonds of subsidiary company, to reimburse for expenditures made for additions and for other corporate purposes	4½	100	4.50
West Penn Power Co.	10,000,000	30	First mortgage gold bonds, series H	To redeem bonds and for other corporate purposes	4	96	4.23
Pennsylvania Electric Co.	9,000,000	1	Gold notes	...	3½	99.76	3.75
Total	$103,000,000			Rights			
Total amount actually realized	84,331,000			Total financing	$84,331,000		

CURRENT EARNINGS REPORTS OF ELECTRIC LIGHT AND POWER COMPANIES

Operating Companies

	1931	1930	Per Cent Increase	Operating Ratio 1931	Operating Ratio 1930
Alabama Power (Year ended May 31)					
Gross earnings	$17,922,254	$18,042,247	—0.7	42	41
Net earnings	10,386,779	10,655,931	—2.5	..	..
Consolidated Gas, Electric Light & Power Co. of Baltimore (Year ended May 31)					
Gross earnings	12,623,831	12,532,880	0.7	59	60
Net earnings	5,197,217	5,050,497	2.9	..	..
Detroit Edison (Year ended June 30)					
Gross earnings	51,170,159	56,039,867	—8.7	66	67
Net earnings	17,101,603	18,429,254	—7.1	..	..
Eastern Texas Electric (Year ended May 31)					
Gross earnings	9,935,277	10,035,293	—0.0	62	59
Net earnings	3,792,682	4,177,365	—9.2	..	..
El Paso Electric (Year ended May 31)					
Gross earnings	3,616,333	3,602,715	0.4	55	57
Net earnings	1,635,917	1,555,781	4.2	..	..
Georgia Power* (Year ended May 31)					
Gross earnings	25,824,141	26,595,599	—2.9	50	47
Net earnings	12,849,135	14,074,439	—8.7	..	..
Gulf States Utilities (Year ended May 31)					
Gross earnings	6,899,488	6,955,338	—0.8	59	55
Net earnings	2,838,674	3,131,402	9.3	..	..
Kansas City Power & Light (Year ended May 31)					
Gross earnings	14,815,998	14,667,446	1.0	47	50
Net earnings	7,875,139	7,362,007	7.0	..	..
Puget Sound Power & Light (Year ended May 31)					
Gross earnings	16,594,740	16,861,462	—1.6	55	57
Net earnings	7,449,943	7,329,934	1.6	..	..
Southern California Edison (Year ended June 30)					
Gross earnings	41,411,589	40,794,717	2.0	32	34
Net earnings	28,380,504	27,090,615	5.0	..	..
Tampa Electric (Year ended June 30)					
Gross earnings	4,533,620	4,580,852	—1.0	52	55
Net earnings	2,163,689	2,071,943	4.4	..	..
Tennessee Electric Power (Year ended May 31)					
Gross earnings	14,110,279	15,280,574	—7.7	52	51
Net earnings	6,714,276	7,535,195	—10.7	..	..
Virginia Electric & Power (Year ended May 31)					
Gross earnings	17,064,648	17,172,693	—0.6	55	55
Net earnings	7,728,569	7,785,285	—0.7	..	..

Holding Companies

American & Foreign Pwr. & Subs. (Year ended March 31)					
Gross earnings	76,410,288	69,797,773	9.5	50	50
Net earnings	38,652,673	34,793,799	11.1	..	..
American Commonwealths Power (Year ended May 31)					
Gross earnings	27,405,785	27,053,570	1.3	49	54
Net earnings	13,964,058	12,441,224	12.2	..	..
American Water Works & Electric & Subs. (Year ended May 31)					
Gross earnings	52,567,137	54,958,419	—4.3	51	50
Net earnings	25,408,290	27,316,405	—7.0	..	..
Cities Service (Year ended June 30)					
Gross earnings	48,812,304	56,217,280	—13.1	..	..
Net earnings	46,139,656	54,460,130	—15.3	..	..
Eastern Utilities Associates & Constituent Cos. (Year ended May 31)					
Gross earnings	9,188,349	9,373,722	—1.9	58	60
Net earnings	3,832,226	3,772,918	1.6	..	..
Electric Bond & Share (Year ended June 30)					
Gross earnings	46,953,106	53,263,165	—11.8	..	..
Net earnings	36,860,346	41,095,006	—10.3	..	..
Federal Light & Traction & Subs. (Year ended May 31)					
Gross earnings	8,337,816	8,453,151	—1.4	57	57
Net earnings	3,592,496	3,608,083	—0.4	..	..
Nevada-California Electric & Subs. (Year ended June 30)					
Gross earnings	5,795,497	5,674,201	2.1	48	49
Net earnings	3,007,505	2,909,725	3.4	..	..
Public Service Corporation of New Jersey & Subs.† (Year ended June 30)					
Gross earnings	139,272,569	138,267,082	0.7	68	69
Net earnings	45,019,200	42,397,801	6.2	..	..
Standard Gas & Electric & affiliated Cos. (Year ended May 31)					
Gross earnings	151,185,620	155,404,196	—2.7	..	..
Net earnings	73,126,794	74,921,058	—2.4	..	..

* Includes Columbus Electric & Power. † Operating expenses including depreciation.

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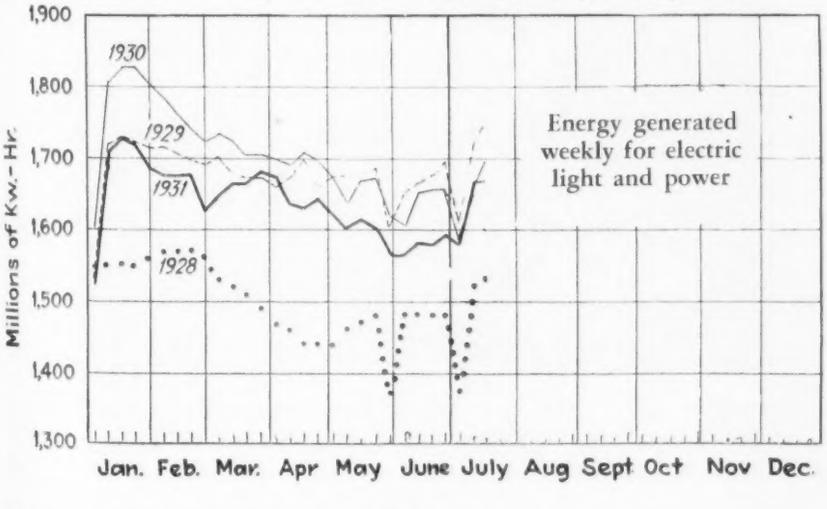
Weekly Energy Rises

WEEKLY OUTPUT OF ELECTRIC light and power companies has for some time been about equal to that of a year ago; in the weeks ended July 4, 11, 18 and 25 it was successively 0.3 per cent less, 0.3 per cent more, 1.6 per cent less and 1.9 per cent less, though last week's exceeded the preceding week's.

For the past five weeks and for corresponding periods in earlier years the production, as estimated by the statistical research department of the National Electric Light Association, was:

Week Ended	Millions of Kw.-Hr. 1931	1930	1929	1928
June 27	1,593	1,657	1,698	1,480
July 4	1,576	1,581	1,611	1,366
July 11	1,655	1,650	1,717	1,521
July 18	1,667	1,693	1,748	1,530
July 25	1,680	1,713	1,743	1,539

The general level, over a period of weeks, on the Atlantic and Pacific Seaboards continues to be above last year's by a few per cent, and in the central region below, by 4 to 5 per cent.



Labor Uses Influence on Behalf of Montreal Utility

ORGANIZED LABOR in the city of Montreal has taken upon itself the task of trying to induce the federal government to exempt the Montreal Light, Heat & Power Consolidated from payment of a heavy corporation income tax which, while not paid by publicly owned gas and electric power utilities, forces the private company of Montreal to charge higher rates to local consumers. In 1930 the Montreal company paid, on behalf of its customers, an amount of $748,363 for income tax. The recent budget provisions of the federal government, which increases the corporation income tax from 8 to 10 per cent, and makes it retroactive on 1930 incomes, demands an additional 25 per cent of the amount paid, or a total approximating $935,454.

The Montreal company officials point out that this sum, if applied to the present maximum rates of 3 cents per kilowatt-hour for electricity, would effect a reduction of 2.58 cents. In their campaign on behalf of the company, the labor clubs of the city are being supported by leading citizens of the metropolis.

Business News and Markets

Electrical Manufacturing Companies Merge

ANNOUNCEMENT IS MADE by the Allis-Chalmers Manufacturing Company of Milwaukee, Wis., of the acquisition of the principal assets of the American Brown Boveri Company, Inc., and the capital stock of Condit Electrical Manufacturing Corporation of Boston, Mass. By this purchase Allis-Chalmers secures several new lines of equipment, such as electric railway apparatus, mercury-arc rectifiers, blowers, electric furnaces and oil circuit breakers.

After completing the manufacture of goods on order at Camden, N. J., the operations now carried on by the American Brown Boveri Company, Inc., will be segregated. The large apparatus departments and work, with substantially the same personnel, will be transferred to the Allis-Chalmers plants at Milwaukee and Pittsburgh, while the remainder will be moved to the plant of the Condit Electrical Manufacturing Corporation at Boston, Mass. The Allis-Chalmers district and branch sales offices will, in the future, serve as the main outlet for the former American Brown Boveri products.

Ownership of the Condit Electrical Manufacturing Corporation of Boston will secure for the Allis-Chalmers Manufacturing Company a New England manufacturing plant and increased service, distribution and marketing facilities in that section. With the manufacture of products to be transferred to the New England plant, and the return to normal business, the manufacturing activities of the New England plant should be substantially increased.

The corporate entity, the organization, plant and product of the Condit Electrical Manufacturing Corporation of Boston, for 31 years manufacturer of oil circuit breakers, will be retained as at present. With few exceptions, the present sales connections of the Condit corporation throughout the United States will be continued.

The Allis-Chalmers Manufacturing Company's report for the six months of 1931 shows a net profit, after all charges including federal taxes, of $1,006,061, equivalent to 77½ cents per share on the 1,295,900 shares of no-par common stock issued and outstanding June 30, 1931. This compares with $2,351,541 for the corresponding six months of 1930 or $1.81 on a similar per share basis. For the June quarter the net was $523,254, compared with $1,180,603 for like period a year ago.

Bookings for the current six months amounted to $12,224,877, contrasted with $29,480,951 in the 1930 period. Unfilled orders June 30, 1931, aggregated $9,032,532, as against $13,002,924 at the close of 1930.

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Southern States Equipment Gets Utility Order

SOUTHERN CALIFORNIA EDISON Company has awarded to the Southern States Equipment Company, Birmingham, Ala., the contract for the 220,000-volt disconnecting switches for the Saugus substation job.

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Westinghouse Reorganizes Sales Department

ANNOUNCEMENT HAS BEEN MADE by J. S. Tritle, vice-president and general manager of the Westinghouse Electric & Manufacturing Company, of the appointment of T. J. Pace, assistant to vice-president, in charge of general market planning and research analysis; M. B. Lambert, sales manager in charge of transportation department; O. F. Stroman, sales manager in charge of industrial department, and R. A. Neal, sales manager in charge of central-station department. All have been with Westinghouse for many years.

General Electric Profits Shrink 26.5 Per Cent

ORDERS RECEIVED BY THE General Electric Company for the first six months of 1931 amounted to $141,428,978, compared with $190,313,758 for the corresponding period last year, Gerard Swope, president, announced this week.

Sales billed for the six months of 1931 amounted to $141,180,091, compared with $197,229,346 for the corresponding period last year.

Profit available for dividends on common stock for the first six months

	1931	1930
Net sales billed	$141,180,091	$197,229,346
Less: Cost of sales billed, including operating maintenance and depreciation charges, reserves and provision for all taxes	124,761,555	174,174,425
Net income from sales	16,418,535	$23,054,920
Other income, less interest paid and sundry charges	6,392,685	7,505,824
Profit available for dividends	$22,811,221	$30,560,744
Less: Cash dividends on special stock	1,287,498	1,287,468
Profit available for dividends on common stock	21,523,722	29,273,276

of 1931 was $21,523,722, compared with $29,273,276 for the first six months last year. The profit available for common stock for the six months is equivalent to $0.75 per share in 1931 and $0.01 per share in 1930 on the 28,845,927 shares outstanding in both periods. The quarterly dividend is 40 cents.

The stockholders to whom the July

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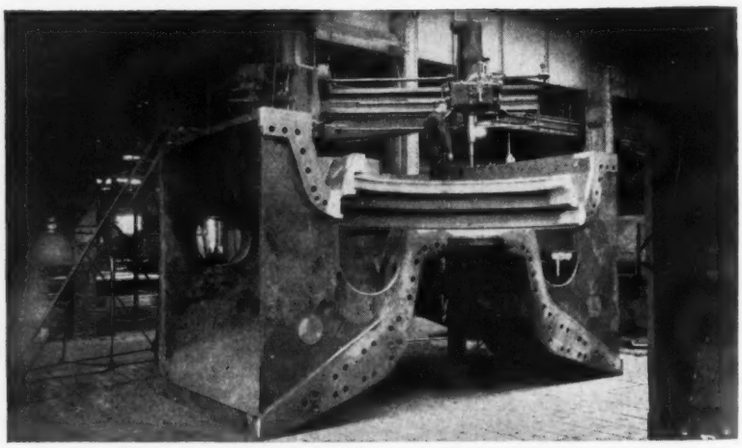
DRILLING A TURBO-GENERATOR'S EXHAUST CASING



Drilling a 35-ton gray iron casting, part of the exhaust casing of a large steam turbo-generator under construction at the Schenectady Works of the General Electric Company

dividend is to be distributed total 133,163, compared with 116,750 at the end of 1930, and with 88,408 a year ago, an increase of 50 per cent over a year ago.

Comparative statement of sales and earnings for the six months are given in the table on page 216.

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Power Industry Leads in Employment Stability

THERE IS GREATER STABILITY of employment and wages in the electric light and power industry than in any other major industrial group reporting to the United States Bureau of Labor. This exceptional achievement, illustrating the public service rendered by the electric utilities as a shock absorber during periods of depression, is shown by preliminary studies made by the committee of stabilization of employment of the National Electric Light Association, according to a statement issued today by Charles L. Edgar, Boston, chairman of the committee.

"We find widespread application by electric utility executives of a policy of maintaining employment and wages," says Mr. Edgar. "The National Electric Light Association does not, of course, determine any policies of its member companies, but our committee, which has been in touch with leading utility executives, finds that no subject is receiving more earnest consideration by them. We are confident this policy will be continued and the committee will lend every possible assistance.

"More than 285,000 persons are now directly on the payroll of the electric utilities and their annual wages amount to approximately $440,000,000.

"The latest figures of the United States Bureau of Labor Statistics show that the number of employees engaged in the operation of the electric light and power industry is 97.1 per cent of the number employed during the boom year 1929, while the total amount of wages is 97.6 per cent of the wages paid for corresponding periods of that year.

"The bureau's periodical reports on trend of employment show that the electric light and power industry indices of employment and wages have been consistently higher than those of all of the 23 other major industrial groups, manufacturing and non-manufacturing, on which reports are regularly issued."

Finds Trade Decline More Than Seasonal

FINDINGS of the National Industrial Conference Board in regard to recent business are thus summarized:

Business in June declined more than seasonally, continuing the contraction begun during the previous month. Unless a reversal is experienced in July, the low point of the depression reached several months ago may be overtaken in the downward movement.

Production in the basic industries showed generally downward tendencies. Although distribution of commodities by freight in June held up well relatively to seasonal expectations, the volume of trade registered by retail sales was discouraging. Commercial failures declined more than seasonally in number but not in liabilities, which should have slackened materially at this time of the year.

Activity in the automotive industry declined sharply, as did output in the steel industry. A more than seasonal contraction was also in evidence in pig iron production. Total construction showed an upward tendency, though residential contract awards declined more than seasonally. The output of electric power declined more than usually between May and June. Bright spots in the situation are observable in the wool, shoe, and tire industries.

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Resale Price Maintenance Laws Not Needed, Is Claim

LEGISLATION permitting resale price maintenance is not called for at present, according to the most recent findings of the Federal Trade Commission as reported to Congress.

Prior to the issuance of its first report in January, 1929, according to Francis E. Neagle, counsel for the National Electric Light Association, the commission sent questionnaires to a large number of manufacturers. Out of 849 who replied, 69 per cent favored resale price maintenance. A later questionnaire was sent out and only 29 per cent of those who replied favored resale price maintenance. Wholesalers, however, almost unanimously favored price maintenance.

While some of those circularized demanded legislation legalizing price contracts when subject to government approval as to fairness of prices, the commission feels that it would be too difficult to determine operating cost figures so as to show what margin of profit would be fair. It adds that governmental participation in the control of prices would be of questionable value as well as a dangerous departure from present practice.

This decision of the commission, according to Mr. Neagle, will probably count heavily against the Kelly-Capper bill, which, in various forms, has been before Congress for several years. Representative Kelly, sponsor of the Kelly-Capper bill, has issued a statement attacking the Federal Trade Commission for its change of viewpoint on the need for resale price maintenance legislation.

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Baldwin Locomotive Buys Five Companies

THE BALDWIN LOCOMOTIVE WORKS of Philadelphia has purchased the subsidiary companies of Cramp-Morris Industrials, Inc., namely: I. P. Morris & De La Vergne, Inc., De La Vergne Engine Company, Pelton Water Wheel Company, Cramp Brass & Iron Foundries Company, Federal Steel Foundry Company.

The first three mentioned have become subsidiaries of the Baldwin-Southwark Corporation, which, in turn, is one of the principal units of the Baldwin Locomotive Works. The Pelton Water Wheel Company will continue to operate as an independent unit with headquarters in San Francisco, Calif.

Cramp Brass & Iron Foundries Company has become a subsidiary of the Baldwin Locomotive Works, while the assets and business of Federal Steel Foundry Company have been acquired by Standard Steel Works Company of Burnham, Mifflin County, Pa., another subsidiary of the Baldwin company.

The principal works and office of the the Baldwin Locomotive Works are located at Eddystone, Pa., and the operations of the above-mentioned subsidiaries, except the Pelton Water Wheel Company and the Federal Steel Foundry Company, will be carried on at the Eddystone works.

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Copper Makes New Low

DOMESTIC BUYING OF COPPER was dull all week and with no improvement in the foreign situation prices eased off a little in some quarters.

	July 22, 1931 Cents per Pound	July 29, 1931 Cents per Pound
Copper, electrolytic	7⅞–8	7⅞
Lead, Am. S. & R. price	4.40	4.40
Antimony	6¾	6.70
Nickel, ingot	35	35
Zinc, spot	4.25	4.225
Tin, Straits	24¼	24¼
Aluminum, 99 per cent.	23.30	23.30

Market Conditions

SEASONAL dullness characterizes the electrical equipment market, generally speaking, buying continuing at a low level. In the East there seems to exist a greater demand in the industrial field than in the central-station field and there have been some sizable awards for iron and steel equipment.

——NEW ENGLAND REPORTS STEADY PROGRESS, with small motor sales as the outstanding feature. General business in the Middle West appears to be marking time.

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PACIFIC COAST

—BUILDING CONSTRUCTION FIGURES *for just half of 1931 show that the Bay region has decreased 5 per cent over the similar period of 1930 and southern California about 40 per cent. Los Angeles and Oakland both show 50 per cent increase for June over May of this year, while San Francisco has increased slightly its figure for the total period as compared with last year.*

Such basic industries as lumber and oil are at a low ebb, but mining, despite low market prices, shows a fair activity, attributed to improvements and reconditioning to fill up a part-time production schedule. Allis-Chalmers reports a well-scattered demand of this character both from copper and gold mines and Westinghouse reports a $15,000 order for machinery and line material from a gold dredger. Fruit products, though hampered by drought and overproduction, will distribute much money through interior towns and cities and has relieved the employment situation, which in July averaged minus 15 per cent for the state over last year. Overseas reports are that business conditions, especially in the Philippines, are just experiencing our initial depression of last year, though wholesalers are bidding on a $10,000 miscellaneous lot of line material and wiring supplies for shipment to Australia and $11,000 worth of Westinghouse standards, tops, transformers and cable have been ordered for Wheeler field, near Honolulu. Another government order covered $9,000 for airport lighting outlets and cable for Pearl Harbor.

Government ordering has not only provided a well-distributed and varied electrical business but also a welcome psychological encouragement. The big contracts are still to be awarded, while others, such as the $9,500,000 federal office building and post office for Los Angeles, have not yet been figured. National parks bought heavily in expectation of a heavy tourist season, many orders ranging from $500 to $1,000 for telephone cable, insulators, reflectors, floodlights and wire being recorded.

An outstanding order for the week covers $30,000 worth of General Electric circuit breakers for various changeovers in the system between Oakland and Sacramento, but power buying otherwise is very poor.

General Electric Company secured a contract for furnishing 100 motors and control apparatus involving approximately $20,000 from the Weyerhaeuser Timber Company for installation in a pulp and paper mill at Longview, Wash., the order including machines from 200 hp., down. Other sales reported last week included eighteen motors from 10 hp. down, to dealers in irrigation districts, ten machines from 40 hp. down, to the Farmers' National Grain Corporation for installation in a grain elevator at Spokane, approximately 35 motors from 50 hp. down, the majority 20 hp. and under, to mills, allied woodworking plants and miscellaneous sources, fifteen distribution transformers, 7½s and 10s, and 30 transformers from 15 kva. down to a local central station and transformers from 15 kva. down to a local central station and 150,000 lb. of weatherproof copper wire, the latter purchased by the city of Seattle from W. R. Hendry Company for $18,000. Seattle Lighting Department, through Board of Public Works, is taking bids for 10,000 ft. of galvanized guy wire and has requisitioned 12 miles of 795,000-circ.mil Mallard conductor.

CONSTRUCTION PROJECTS

Pacific Gas & Electric Company, San Francisco, Calif., plans extensions and improvements in power substations and transmission lines at Redding, Calif., to cost close to $50,000. Glendale, Calif., has authorized installation of an ornamental lighting system. Parker Brick Company, Santa Barbara, Calif., plans plant at Reno, Nev., to cost over $45,000. Challenge Creamery & Butter Association, San Francisco, Calif., plans plant to cost over $100,000. Mountain Lumber Company, Tacoma, Wash., plans improvements in plant to cost over $70,000. Machinery Mart, Inc., Seattle, Wash., plans plant to cost about $45,000.

SOUTHWEST

—NO MARKED CHANGE *in general conditions has been indicated by the different manufacturers interviewed. Buyers, both industrials and utilities, are only calling for their daily necessities, but the actual volume of sales continues close to normal for the season.*

Contracts reported closed include electric elevator equipment for a large terminal building to cost $25,000 and motors and control for nine trolley buses for a city railway company in the southern part of this district to cost $24,000.

CONSTRUCTION PROJECTS

Monsanto Chemical Works, St. Louis, Mo., has approved plans for factory branch at East St. Louis, Ill., to cost $100,000. Texas Power & Light Company, Dallas, Tex., contemplates ornamental lighting system at Belton, Tex. Louisiana Power & Light Company, New Orleans, La., plans transmission line from power plant at Sterlington, La., to Hodge, La., to cost about $100,000.

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NEW ENGLAND

—SALES OF ELECTRICAL *equipment in New England during the past week progressed steadily, with small motor sales and scattered orders in a wide range of equipment featuring the trend. A manufacturer of small motors notes that July is closing with improved sales volume.*

—MANUFACTURERS OF *oil-burning equipment and refrigeration apparatus are more active in buying electrical equipment. Central-station supplies continue to show spotty trend, though one manufacturer reports negotiations of interest pending.*

Orders for transformers recently placed by one large power company include three 300-kva., six 200-kva. and two 37½-kva. equipment for a new substation and additions for service lines in eastern Massachusetts amounting to about $16,000 for the electrical equipment. Among the special electrical equipment which shows special activity is noted a demand for electric traffic control signals and electric meters. Water-heater sales are active in eastern Massachusetts. Recently a 300-kw. enameling oven was ordered by a prominent stove manufacturer. Arc welders are more active and interest in portable 200- to 300-amp. units is more brisk, and according to one manufacturer July sales show improvement over the previous month. Electrical contracts gained during the past month.

in particular wiring for power and light in institutional type buildings. Schedule material for this purpose is moving steadily.

CONSTRUCTION PROJECTS

Collins Manufacturing Company, Holyoke, Mass., has plans under way for a power plant at paper mill at North Wilbraham, estimated to cost about $60,000. Boston Elevated Railway Company, Boston, Mass., has filed plans for extensions and improvements in power plant to cost about $70,000. Merrimac Chemical Company, Everett, Mass., has filed plans for an addition to cost about $55,000.

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MIDDLE WEST

—GENERAL BUSINESS *in the Middle West section again appears to be marking time. While the volume of business is holding up fairly well, seasonal inactivity, or a returning hesitancy, is slowing down the return of better business.*

—THE GENERAL TREND *is considerably mixed, and while the optimistic spirit noticeable at the beginning of the quarter still prevails, present conditions are not such as to sustain optimism for any great length of time.*

The larger number of semi-annual reports being announced at this time, indicating better second quarter business, should, it is hoped, have some stimulating effect. The major industries are generally inactive, proceeding for the most part at a considerably reduced rate of production. Railroad equipment purchasing is at a decidedly low level, and maintenance purchasing, although improved somewhat, is negligible. The various utility companies have slowed up their construction work to a certain extent, having caught up with their construction programs. Among the interesting orders placed this week were the following items: Twelve 600-amp., 15-kv., single-pole, single-throw outdoor type disconnecting switches and storage battery parts to cost approximately $42,000.

CONSTRUCTION PROJECTS

Institution for Deaf, Flint, Mich., has plans for industrial and mechanical shop to cost about $150,000. State Highway Commission, Indianapolis, Ind., has filed plans for automobile service, repair and garage building to cost $150,000. Pennsylvania & Ohio Power Company, Youngstown, Ohio, contemplates addition to steam-operated electric power plant at Toronto, Ohio, including extensions in transmission lines to cost about $2,500,000. National Milling Company, Toledo, Ohio, has approved plans for extensions and improvements in grain mill to cost about $150,000. State Commissioner of Purchases, St. Paul, Minn., is asking bids until August 6 for fuel-oil-burning equipment for power plant at State Reformatory, St. Cloud, Minn.

EASTERN

—SUMMER DULLNESS PERVADES *the electrical equipment market in the Eastern district and, except in a few instances, orders have slumped to a low point. While inquiries continue on a fair basis, the majority are for specialty account, such as radio apparatus, and basic lines of consumption show little inclination to make purchases.*

—GOVERNMENT BUSINESS CONTINUES *to assist the situation, both with respect to immediate commitments and future orders, with keen bidding on the part of manufacturers to secure some worth-while contracts from that quarter. The result is that prices show inclination to trend downward on government bids. Wire and cable has secured some attention and increased sales have resulted.*

The Bureau of Standards, Washington, D. C., has closed bids for electric transmitting equipment with the Westinghouse Electric & Manufacturing Company, submitting the low figure at $22,050 for major items among a group of three bidders. National Electrical Supply Company has secured an award from the Army Engineer Corps for 15-kva. transformers, while the Commercial Engineering Company has obtained a contract from the same office for oil circuit breaker, switchboard, wiring, etc. Westinghouse Electric & Manufacturing Company will furnish primary radio equipment for the new navy dirigible, U.S.S. *Akron*. This is to be the most powerful apparatus ever installed in aircraft.

With central-station business ebbing off, industrial demand shows more spirit, and with some sizable awards for iron and steel equipment, it is expected that call for electrical apparatus will follow in the near future. Westinghouse Electric & Manufacturing Company will furnish motors, controls and auxiliary electrical equipment for a new 15-ton ore bridge to be installed at the Braddock, Pa., plant of the Carnegie Steel Company. Bethlehem Shipbuilding Company, Quincy, Mass., has taken a contract for renewing high and low pressure turbine motors for the steamship *Walter A. Luckenbach*. Four leading makers of electric refrigerators report increased orders with corresponding heavier production, and one manufacturer shows an advance of 27 per cent in sales for June, as compared with the same month last year.

CONSTRUCTION PROJECTS

Signal Supply Officer, Signal Corps, Army Base, Brooklyn, N. Y., will receive bids until August 11 for 250 electric bell mechanisms, 330 gongs, etc. (Circular 5). Board of Education, Buffalo, N. Y., will receive bids until August 4 for electrical equipment, manual training and science equipment for Grover Cleveland high school. Colonial Knitting Mills, Inc., Philadelphia, Pa., plans plant at Cape May Court House, N. J., to cost $150,000. Passaic Valley Water Commission, Paterson, N. J., will receive bids until August 10 for a complete electric power substation, with transformers, switchboard and instruments, and for a transmission line, about 2.4 miles long. Spang, Chalfant & Company, Pittsburgh, Pa., contemplate addition to steel pipe manufacturing plant to cost over $150,000. Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until August 11 for a quantity of electric cable and wire for Eastern and Western yards (Schedule 6208). General Purchasing Officer, Panama Canal, Washington, D. C., will receive bids until August 7 for wire, switches, fuses, streetlight globes, steel conduit, conduit fittings, etc. (Panama Schedule 2672.)

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SOUTHEAST

—CENTRAL-STATION ACTIVITIES *continue at a low level with purchases largely confined to maintenance requirements and a few small orders for equipment to be used in system improvements. However, volume has been fairly well maintained by activity in the heavier lines of electrical appliances.*

—EXPANSION AND REHABILITATION *in the textile industry have brought out some moderate-sized wiring contracts and a much larger volume of wiring business is in prospect, with interest centered around government projects.*

One utility company's orders for distribution and power transformers amounted to $11,000. It also purchased $17,000 worth of feeder voltage regulators, five carloads of poles and $11,000 worth of wire. A $30,000 wiring contract for an addition to a textile mill in northwest Georgia was let during the week and another textile mill in southwest Georgia is making some changes in its equipment which will involve about $20,000 worth of wiring. Contracts will probably be let this week for the $2,000,000 post office in Atlanta and six other smaller post office buildings in Georgia. Bids are out on electrical equipment for Barsdale Field, U. S. Army Airport, Shreveport, La., which will amount to about $50,000.

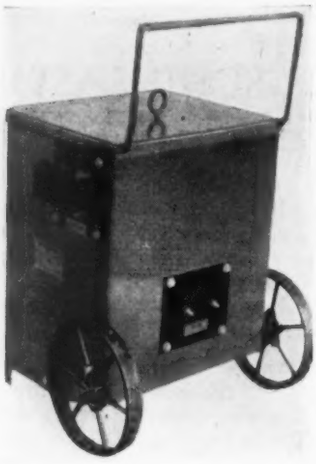
CONSTRUCTION PROJECTS

Bureau of Yards and Docks, Navy Department, Washington, D. C., is asking bids until August 12 for a cross-compound, steam-driven air compressor for the Norfolk, Va., navy yard (Specification 6595). Interstate Granite Corporation, Charlotte, N. C., plans plant to cost about $100,000. Wayne Agricultural Works, Inc., Goldsboro, N. C., plans improvements in agricultural implement plant to cost $80,000.

New Equipment Available

8.5 to 125-Amp. A.C. Welding Set

AN ALTERNATING-CURRENT ARC-WELDING SET designed for operation at between 8.5 and 125 amp. has been announced by the Westinghouse Electric & Manufacturing Company. This new welder meets the demand for the economical arc welding of thin gage material such as that encountered in the manufacture of metal furniture, sheet



iron cabinets and containers, in aircraft fabrication work, job and garage repair work and in the fabrication and erection of ventilating and material-handling equipment of many kinds.

The "FlexArc" a.c. welder may be used in conjunction with either bare or coated electrodes from $\frac{1}{16}$ to $\frac{1}{8}$-in. diameter. Many of the ferrous alloy materials commonly used with reversed polarity direct current are effectively and easily applied in conjunction with this welder. It has also proved sucessful in the welding of aluminum. This a.c. unit is recommended for work where the more common 200-amp. motor-generator type of welder is considered too large or expensive.

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Raise Power Factor of Neon Signs

FOR RAISING THE POWER FACTOR of the usual neon sign from as low as 40 per cent to better than the 85 per cent demanded by some companies the Dubilier Condenser Corporation of New York City, in collaboration with the Claude Neon Lights, Inc., has developed a line of special capacitors.

The Dubilier engineers recommend power-factor correction of neon signs at 220 volts rather than 110 volts. The power-factor correction capacitor is type PL2477 for the 220-volt application, measuring 5x1½x8 in. high. It is inclosed in a substantial steel case with mounting feet and pig-tail leads, ready to be placed alongside the transformer supplying each section of the sign. External mounting of the correction capacitor is preferable to incorporation in the transformer itself, particularly in the matter of heat dissipation. For correction at 110 volts, type PL2547, measuring $5\frac{3}{16}$x$2\frac{3}{16}$x$9\frac{3}{4}$ in. high, is employed.

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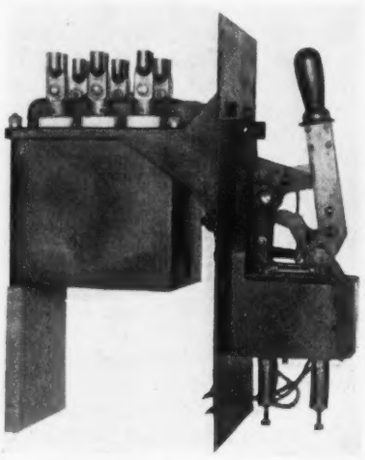
Dead-Front, Low-Voltage Breaker

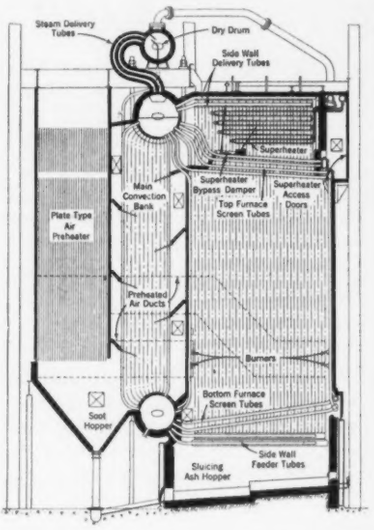
A NEW DEAD-FRONT OIL BREAKER, class 9, for low-voltage distribution switchboards, is announced by the Roller-Smith Company, New York. The small space requirements of this breaker, which requires a panel area of only 12x22½ in., with ample room for removing tanks and servicing the breaker, adapts it for distribution boards. Eight circuits can conveniently be placed on a panel 24x90 in. The class 9 breaker is of modern construction throughout. It has inclosed operating mechanism, one-piece porcelains, sturdy cast frame and heavy welded tank, with insulating cell per phase. The contacts are inverted laminated brushes with the lamination extending through the bush-



ing to the terminals without joints. This construction is especially well suited to low voltage where high currents are encountered in short circuits. The breakers are built in 200, 400 and 600 amp. capacities for 750 volts.

Steam-Generating Unit

A STANDARD STEAM-GENERATING UNIT built in various sizes and providing a wide range of capacities under any desired conditions of steam temperature and pressure has been announced by the Combustion Engineering Corporation, New York. Detail designs have been



completed for eight sizes with capacities from 70,000 to 400,000 lb. of steam per hour, from and at 212 deg. F.

The design combines in one unit all the elements required for fuel burning, steam generation and superheating, heat recovery and ash disposal. The pipes and headers essential for completing the circulating system of water walls are located entirely within the casing, where, in addition to performing their normal function as circulators, they serve as effective heat-absorbing surface.

All four walls of the furnace are water-cooled, each wall being composed of a solid row of tubes, with only sufficient space between them for construction requirements. The water-wall feeder and delivery tubes complete the heating surface of the furnace proper, nearly all of which is exposed to radiant as well as convection heat.

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A NEW AND IMPROVED LINE OF STIFF-ARM FITTINGS is announced by the Carrick Engineering Company, Chicago. The installation of a system of automatic combustion control requires certain mechanical connections between the regulating units of the system and the devices which are to be controlled, such as dampers, motor controllers, regulating valves, shafts, etc. The stiff-arm fittings have been designed for the purpose of providing means for rigidly connecting the controlled devices to the regulating units.